This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

COUNTWAY LIBRARY
HC 1XZ1 D

$3.00

Dr. N. Y. Leet.

Scranton, Pa.

FIRST LINES
OF THE
THEORY AND PRACTICE
OF
SURGERY.

$5.00 R. C. Leek

Dec 14.77

THE

FIRST LINES

OF THE

THEORY AND PRACTICE

OF

SURGERY;

INCLUDING

THE PRINCIPAL OPERATIONS.

BY SAMUEL COOPER,

SENIOR SURGEON TO UNIVERSITY COLLEGE HOSPITAL, AND PROFESSOR OF SURGERY IN THE SAME COLLEGE, ETC.

WITH NOTES AND ADDITIONS,

BY WILLARD PARKER, M. D.,

PROFESSOR OF SURGERY IN THE COLLEGE OF PHYSICIANS AND SURGEONS IN THE UNIVERSITY OF THE STATE OF NEW YORK, ETC., ETC.

IN TWO VOLUMES.

VOL. I.

Fourth American, from the Seventh London Edition.

NEW YORK:
SAMUEL S. AND WILLIAM WOOD,
261 Pearl Street.

1844.

Entered according to Act of Congress, in the year 1844, by
SAMUEL S. AND WILLIAM WOOD,
in the Clerk's office of the District Court of the Southern
District of New York.

BOSTON MEDICAL LIBRARY
IN THE
FRANCIS A. COUNTWAY
LIBRARY OF MEDICINE

PREFACE

TO

THE SEVENTH EDITION.

THIS work was originally designed as an elementary treatise on Surgery; and in all the editions which it has passed through, the same primary object has never been departed from. The principal wish of the Author has been to offer such views of scientific and practical Surgery, as the student and young practitioner may refer to with advantage. Above all things, he is desirous that the publication may serve as a text-book for the Lectures, annually delivered by him to the Surgical Class of University College; and, if the gentlemen, who compose that class, shall be in any way benefited by the undertaking, or derive from it a clearer comprehension of the doctrines, which they do him the honor of listening to, the pleasure that he will experience in thus promoting their advancement, will be his highest reward.

The reader, who compares this edition with the last, will discover numerous corrections; and in almost every page, new matter. All this seemed requisite to adapt the work to the present state of Surgery.

7 Woburn Place, Russell Square,
November 26, 1839.

PREFACE

TO THE

FOURTH AMERICAN EDITION.

AT the request of the publishers, I have carefully perused the seventh edition of Mr. Cooper's First Lines of Surgery. I have found occasion to add a few notes, in order to explain some views, and to introduce some new subjects: these are included in brackets. The work needs no commendation at my hand. It has already passed through seven editions in England; and the editions in this country, by Drs. Stevens, of New York, and M'Clellan, of Philadelphia, have been some time since exhausted. These facts sufficiently attest the estimation in which the work is held, both in England and America.

WILLARD PARKER.

754 Broadway, New York,
October, 1844.

CONTENTS.

ELEMENTARY AND GENERAL SUBJECTS.

Abscesses 50
“ Treatment . . 63
Adipous Sarcoma . . . 436
Amputation for Mortification . 103
“ “ Gunshot Wounds 238
Anchylosis 420
Aneurism 326
“ Causes . . . 335
“ Treatment . . 339
“ by Anastamosis . 439
Aneurismal Varix . . . 355
Anthrax or Carbuncle . . 136
Bites of Venomous Snakes . 242
Boils 135
Buboes 518
Bunions 428
Burns and Scalds . . . 140
Bursæ Mucosæ 426
Cancer 448
Chancres 508
Caries, or Ulceration of Bones . 362
Cartilaginous, or Osseous Substances in Joints . . . 402
Cellular Tumor . . . 438
Chemical and Mechanical Injuries 139
Cicatrisation 221
Chilblains 165
Cold, effects of 155
Compound Fractures . . . 296
Complication of Fracturse, with Hemorrhage . . . 303
Compound Dislocations . . 318
Contused and Lacerated Wounds 213
Contusions 319
Coxalgia, or Scrofulous disease of the Hip Joint . . . 412
Deformities brought on by Burns 154
Diseases of the Blood-vessels . 323
“ “ Veins . . 346
“ “ Bones . . 358
“ “ Joints . . 399
“ “ Tendons and Bursæ Mucosæ 423
Dislocations or Luxations in general 304
Dislocations, Treatment . . 313
“ Compound . . 318
Encysted Tumors, or Wens . 444
Erysipelas 123
Exostoses 392
Fatty Tumors 436
Fractures 266
“ Un-united . . . 292
“ Compound . . 296
“ Complicated . . 303
Fragilitas Ossium . . . 385
Fibro-cartilaginous Tumors . 438
Fistulæ 67
Fungus Articuli, or pulpy thickening of the Synovial Membrane 404
Fungus Hæmatodes . . 462
Furuncle, or Boils . . . 135
Gangrene, Dry, Humid, and Traumatic 76
Gangræna Senilis . . . 88
Gangrene, Hospital . . 99
Ganglia 424
Granulation and Cicatrisation 218
Gunshot Wounds . . . 225
Hemorrhage 173
Hectic Fever 68
“ Treatment . . 71
Hydrophobia—Rabies Canina . 247
Incised Wounds . . . 170
Inflammation 13
“ Treatment of, . 35
“ of Arteries . . 324
“ of the Synovial Membrane 399
Lues Venerea 480
Luxations 304
Malignant Pustule . . . 138
Mammary Sarcoma . . . 438
Melanosis 464
Mollities Ossium . . . 384

Mortification 73
" Causes of . . 77
" Treatment of . 81
" from Debility . . 93
" from Injuries of large Arteries and Veins . . 94
Mortification from Pressure . 96
" from Deleterious Influence of certain Poisons . 99
Mortification from eating spurred rye 101
Mortification, of Amputation for, 103
Nævi 439
Necrosis . , ... 365
Nodes 531
Osteo Sarcoma 398
Ostitis 359
Pancreatic Sarcoma 437
Phlebitis 347
Poisoned Wounds 241
Polypi 443
Process of Union of Fractures . 282
Pulsatory Tumors 397
Punctured Wounds 209
Pus, qualities of 56
Reproduction of lost parts . . 224
Rickets, or Rachitis . . . 386
Sarcomatous Tumors 436
Secondary Syphilis . . . 524
" " Treatment . 533
Scalds 140
Schirrus and Cancer 448
Sprains 321
Spina Ventosa 361
Scrofula or Struma . . . 468
" " Treatment of, 477
Scrofulous disease of Joints, beginning in the Bones . . . 410
Suppuration 50
" Theory of, . . . 57
Syphilis 480
" in Infants 539
Tubercles 473
Tuberculated Sarcoma . . . 438
Tetanus 257
Tumors 430
" Fatty 436
" Encysted, or Wens . 444
" Painful Subcutaneous 439
Ulceration 106
" Symptoms of, . . 109
" of Cartilages . . 406
Ulcers 110
" Treatment 113
Union by the first intention . 196
Un-united Fractures . . . 292
Varicous Veins 352
Warts 444
Wounds 167
" Treatment 195
" Contused and Lacerated 213
" Gunshot 225
" " Treatment . 232
" Incised 170
" In Dissection . . . 244
" Poisoned 241
" Punctured . . . 209

ERRATA.

Page 91, *line* 30, *instead of* paralysis of the arteries being sound,—*read*, paralysis, the arteries being sound,

Page 443, *line* 43, *instead of* caluses,—*read* cellules.

THE
FIRST LINES
OF THE
PRACTICE OF SURGERY.

SECTION I.

Elementary and General Subjects.

INFLAMMATION.

As soon as due proficiency has been made by the student in anatomy, chemistry, the elements of natural philosophy, physiology, and other branches of knowledge, constituting essential portions of the foundation of medical science, he is qualified to commence with advantage the study of disease; the comprehension of which is to be derived, partly from the most authentic discriptions of it, but chiefly from the personal observation of its extremely diversified forms, as they present themselves in the field of experience.

No texture, possessing vessels and nerves, is beyond the reach of the attack of inflammation, and consequently nearly every part of the body is subject to it. In those animals which have no visible nerves, Dr. Macartney believes that the phenomena of inflammation are not exhibited. The nerves are regarded by him, and, I think, correctly, as essentially engaged in the process. Many diseases owe their commencement to it; all mechanical injuries are followed by it; and numerous disorders, not associated with it in their beginning, become complicated and materially influenced by it in their more advanced stages. It is indeed so closely connected with disease in general, either as a cause, an effect, an accidental complication, or even as a means of cure, that there is much truth in the observation, that, when once a student has acquired a knowledge of inflammation and its consequences, and has joined with this information some good ideas of the nature of a few organic diseases, he may be said to command a bird's-eye view of the whole field of pathology.

Inflammation is not always to be regarded as a disease, but frequently as a salutary process, absolutely necessary for the repair or removal of the effects of various injuries and morbid alteration affecting the textures of the animal body. Thus the disease, called hydrocele, is radically cured by exciting inflammation within the tunica vaginalis; and, in wounds of the bowels, a fatal effusion of the intestinal matter can only be prevented by the compact and close state of all the parts within the peritoneum, followed up and cemented by the adhesive inflammation.* Abscesses of the liver discharge themselves sometimes externally, sometimes inwardly into the colon, and occasionally they make their way into the bronchi. In the first case, inflammation glues together the two contiguous portions of the peritoneum, and by means of ulceration, a passage is then safely formed for the matter through such adherent parts of the membrane, and next through the more external textures. Thus, the cavity of the abdomen is preserved from an effusion of pus, which would immediately excite a fatal attack of peritonitis. In the second case, by means of similar adhesions and ulceration, the contents of the abscess are safely conveyed into the intestine. In the third, the two contiguous peritoneal surfaces first, and then the two adjacent pleural surfaces, are rendered adherent by inflammation; and lastly, the ulcerative process opens a way for the pus through these adherent membranes, the diaphragm, the cellular tissue, and through the sides of the bronchi, whence the abscess is discharged by coughing.†

When any part of the animal body is red, swelled, and painful, its temperature, being at the same time raised, its natural secretions altered or suspended, and its functions disturbed, such state of it always receives the name of *inflammation*. It is not, however, every form of inflammation that is characterised by a combination of redness, pain, heat, and swelling: in some cases, there is little or no redness; in some, scarcely any swelling; in others, only a trivial uneasiness tingling, or stiffness, scarcely amounting to pain.

Inflammation is said to be *acute* when attended with redness, heat, swelling, and pain, and when the quickness of its course is such, that it either subsides in a few days, or brings on, in the same space of time, suppuration, ulceration, mortification, or, when seated in important organs, even the patient's dissolution.

---

* In opposition to the commonly received doctrine of inflammation being often a salutary process, essential to the repair of accidental and morbid lesions of textures of the body ("the necessary condition, or means by which," as Dr. Carswell remarks, "most injuries, and all solutions of continuity are repaired"), Dr. Macartney's investigations lead him to conclude, "that the powers of reparation and of reproduction are in proportion to the indisposition, or incapacity for inflammation;" and that "inflammation is so far from being necessary to the reparation of parts, that, in proportion as it exists, the latter is impeded, retarded, or prevented." "On Inflammation," p. 6. 8vo. Lond. 1838. Many of Dr. Macartney's arguments, in support of this view, are derived from what happens in some of the lower animals, which possess no visible nerves, or whose nervous systems are exceedingly simple.

† See Dr. M. Hall's "Principles of Medicine," p. 28.

Chronic inflammation is of a slower and less painful kind, frequently beginning almost imperceptibly, and then lingering in parts for an indefinite period. It may be attended with little heat or pain. Gradual and insidious as its progress may be, it frequently leads in the end to structural changes and functional derangements of the most serious and irremediable kind. Acute inflammation may terminate in it; and many of the slowly formed thickenings and indurations, of various tissues, appear to be effects of it; but the doctrine is far from being tenable, which ascribes to it the origin of those multiform tumors presenting themselves in the body as adventitious formations, or growths, superadded to the primitive textures, and even sometimes annihilating them.

Inflammation is said to be *healthy*, when uncombined with any determinate disease in the part or constitution, capable of exercising an unfavorable influence upon it, and particularly when established for the accomplishment of some salutary purpose in the animal economy. Such inflammation is also sometimes termed *common* or *simple*, and, if it be near the surface of the body, forming a circumscribed swelling, attended with heat, pain, throbbing, and redness, it often receives the name of *phlegmon* or *phlegmonous inflammation*. This is sometimes defined to be inflammation of the cellular tissue; but, if we are disposed to adopt this view, we may say, that it is *healthy* inflammation of that texture; for the cellular tissue is also the principal seat of some other kinds of inflammation, as for instance those of carbuncle, malignant pustule, boils, phlegmonous erysipelas, &c. Phlegmon is defined by Dr. Macartney to be usually the consequence of some injury, or evident irritation, and produced in constitutions, or parts of the body, which have been previously carrying on healthy functions. One of its most distinguishing features is the deposition of fibrine in and around the inflamed part.

Unhealthy inflammation comprises those forms of it whose appearances, progress, and termination, are under the influence of some definite or indefinite disease in the part or the system at large: its varieties are, therefore, as numberless as diseases themselves.

Specific inflammations, which always belong to the unhealthy class, are so called when their appearance, effects, course, and termination, are marked by striking differences from all ordinary cases; such as a connection with, or a dependence upon, a particular diathesis; the operation of an animal poison; the power of generating a contagious or infectious principle, and of being thus propagated from one person to another. Some specific inflammations, and their effects upon the system at large, produce a permanent impression on the constitution, whereby the individual is rendered insusceptible of a second attack of them. Particular kinds of inflammation appear to be considered as specific, partly on account of the peculiarity of their nature, and partly because they require treatment very different from that applied to the ordinary forms of inflammatory complaints. For one or another of these reasons, the inflammation of syphilis, scrofula, small-pox, cow-pox, scarlet fever, and of a multitude of cutaneous diseases, is specific: perhaps, indeed, the number of inflammations entitled to this denomination is much greater than usually calculated, and Rayer may be right in ascribing the peculiarities of cutaneous diseases in general to the specific quality of the inflammation, excited by various causes on the surface of the body.

Inflammation is said to be *primary* or *idiopathic*, when it is the original affection; *secondary* or *symptomatic*, when the consequence of another disorder. The sympathies existing between different parts of the body, as that between the skin and mucous membranes, are usually cited in explanation of the origin of certain inflammations, which consequently receive the name of *sympathetic*. Thus some cutaneous diseases are frequently associated with chronic inflammation of the mucous membrane of the digestive or respiratory organs; while, in other instances, the latter affection, or even ulceration of the mucous membrane of the bowels, follows inflammation, injury, or disease of the cutaneous texture. This fact is often exemplified in erysipelas and extensive scalds and burns. The effects of *phlebitis* in bringing on inflammation and suppuration in various textures and organs, remote from the original disease or injury, must not be confounded with *sympathetic inflammations*.

Amongst the most remarkable effects of inflammation are, the adhesion of parts to one another; the filling up of the interstices of the cellular texture with fibrine; the deposit of the same substance upon free surfaces, in the form of one or several layers, having somewhat of the appearance of a membrane, and hence frequently called a *pseudo-membrane;* or around collections of purulent matter, or around a foreign body lodged in the substance of parts, in which circumstance it is transformed into a cyst, calculated to prevent such foreign body from irritating the neighboring textures; or it is deposited between the surfaces of a recent wound, which have been brought together, where it constitues their first bond of union. Now, all these curious effects and changes, resulting from the exudation of fibrine or coagulating lymph*, and its occasionally becoming vascular and organised, as is frequently exemplified on inflamed serous membranes and in wounds, led John Hunter to name the kind of inflammation producing them the *adhesive*.

When the tendency of inflammation is to cause the production of a peculiar fluid, termed pus, the epithet *suppurative* is employed to denote this character of it. The expressions *ulcerative* and *gan-*

---

* The term *fibrine* is now frequently substituted for that of *coagulating lymph;* but as the latter contains albumen, there is, strictly speaking, a difference between them.

grenous signify its disposition to occasion ulceration and mortification.

Whether inflammation is to be *adhesive*, *suppurative*, *ulcerative*, or *gangrenous*, is chifly determined by the kind of texture affected; the original quality of the inflammation itself; the nature of the exciting cause; or the previous state of the part, or constitution. In serous membranes, adhesive inflammation is more readily excited than suppurative; and this is also the case in the cellular tissue in general, so far as common inflammation is concerned.* On the other hand, a mucous membrane is more prone to suppurative than adhesive inflammation, the latter not taking place, unless the exciting cause act with violence, be of long duration, or of a peculiar description. In inflammation of serous membrances, and at a very early period, as Dr. Carswell has explained, the secreted fluid contains albumen; afterwards, and as the inflammation increases, fibrine is added, and generally an admixture of the coloring matter of the blood; and lastly pus. The same order of succession is also observed to takes place in the fluid products of inflamed mucous membranes. The mucous secretion, however, is, almost from the commencement of the inflammation, replaced by a serous fluid, which is often very abundant; this is succeeded by the presence of albumen and fibrine, and lastly of pus. The different degrees of fluidity, viscidity, and coagulability of the secretions generally of inflamed tissues, are derived from the presence of serum, albumen, and fibrine, in various proportions. As illustrations of the influence of the original quality of the inflammation, I may observe, that such as attends boils and whitlows is remarkable for its tendency to suppuration; while that which is exhibited in carbuncles, malignant pustules, phlegmonous erysipelas, and after the bites of venomous reptiles, is notorious for its disposition to produce extensive gangrene of the cellular tissue. Then some other kinds of inflammation, however severe, rarely or never bring on either abscesses, ulceration, or gangrene, as we find to be the case with gout, rheumatism, and the inflammation taking place in the disease called *mumps*. The effect of the violence and peculiar quality of inflammation, in giving to it the adhesive form in a part or texture not naturally disposed to it, is well exemplified on the mucous membrane of the larynx and trachea in croup, where the interior of these organs becomes the source of a copious and suffocating effusion of coagulating lymph. The difference, made made by the previously healthy or morbid state of parts, on the effects of inflammation, is illustrated in the perilous consequences of an attack of it on limbs already affected with anasarca, or dropsical effusion. The same case likewise generally exemplifies the pernicious influence of an impaired constitution.

---

*Without the qualification here introduced, this doctrine, as taught by John Hunter, would not be correct; for "the cellular tissue is not only more frequently the seat of mortification, but it is also more extensively and rapidly destroyed by it than any other tissue of the body." See Dr. Carswell's "Illustrations of the Elementary Forms of Disease," Fasiculus 7; and one of the most interesting works on Pathology ever published.

Parts remote from the source of the circulation, or having a circulation particularly subject to considerable interruptions and retardations, or to disturbance from inflammation, are more disposed to ulceration and mortification than other parts and textures not under such disadvantages. Hence the frequency of ulcers and sloughing in the lower extremities, of the mortification of tendons, surrounded by abscess, and of the general inability of a cicatrix, a callus, warts, wens, and many other adventitious formations, to bear inflammation, without being likely to ulcerate or mortify. Mucous membranes, and the skin, which are textures of high vascularity, often ulcerate or slough, because peculiarly liable to inflammation.

Generally speaking, *inflamed fibrous tissues*, as they are termed, including tendon, ligament, fascia, aponeurosis, and periosteum, rarely suppurate or ulcerate. Or, perhaps, it may be more correct to say, they do not do so from rheumatic or gouty inflammation; for, in scrofulous disease of the bones and joints, the ligaments and synovial membranes are commonly more or less destroyed by the ulcerative process. Mortification occurs more frequently in the skin, cellular tissue, mucous membranes, and lungs, than in any other tissues or organs, as the immediate effect of inflammation. Serous and fibrous textures never mortify, unless the cellular tisue, from whose vessels their nutrition is derived, has previously been diseased. This, it is to be presumed, often happens when abscesses are formed round tendons. In like manner, also, the death of cartilage and bone is effected by previous disease of the perichondrium, periosteum, and medullary membrane.*

The *redness* of inflamed parts seems to be principally owing to the dilatation of small arteries, and possibly also of small veins, both which orders of vessels become of sufficient size to admit the red globules; and they are not only increased in diameter, but fully injected with blood, or in the state termed by Andral *hyperæmia*. Whether the blood in the minute veins of an inflamed part assumes the scarlet color of arterial blood, is a doctrine rather difficult to prove because the exact line of demarcation between the capillary arteries and the smallest veins does not admit of demonstration. The redness has been partly ascribed to the generation of new vessels; but this doctrine is not tenable as a general one, because redness is producible in a few seconds by friction, heat, and other causes of irritation,—a space of time too short to be consistent with such a view. Many textures, naturally colorless, may also be reddened with fine anatomical injection,—a proof, that the distension of those vessels which already exist, will account for a great deal of the redness. Undoubtedly, inflammation renders vessels plainly visible in certain textures, which cannot be made to manifest vascularity by means of any sort of injection. However, this fact only proves, that it is the nature of inflammation to dilate the minute vessels, and to make them capable of receiving the red globules of the blood. Redness, though a common effect of inflammation, is far from being one of its essential characters; for, notwithstanding the size of the minute arteries may be altered, their dilatation is not invariably such as will enable them to receive the red globules. This is exemplified in inflammation of the arachnoid coat of the brain, and in slight inflammation of the delicate production of the conjunctiva spread over the cornea.

---

* Carswell, op. cit. Fasciculus 7.

The intensity of the redness varies in different examples: thus, some dense fibrous tissues, like tendons and ligaments, exhibit, when inflamed, but inferior degrees of redness; while textures of higher vascularity display a bright and florid red color, as is often seen in cynanche maligna, the pharynx and tonsils presenting almost a fiery redness. The species of inflammation also modifies the color of the inflamed part. The redness of phlegmon is not of the same shade as that of erysipelas, and the color of a carbuncle is deeper, than that of the other inflammations here adverted to.

In genuine erysipelas, " there is so little impediment to the passage of the arterial blood into the veins, that it gives the skin a bright red or scarlet color. Several other inflammations of the skin, as scarlatina, rose-rash, herpes, &c., are distinguished by their bright color; and, indeed, most inflammations of the skin, which do not involve the cellular substance underneath, assume more or less the color of arterial blood. In other instances, where inflammation is attended with much tumefaction or hardness, the color is more or less purple, or that of venous blood; because, under such circumstances, the circulation is impeded; and consequently the blood longer detained, and thereby rendered venous, although still moving in the arteries. The purple color is very remarkable in many scrofulous inflammations and tumors, in which the circulation is languid." * Dr. Macartney also notices the fact or brown-colored inflammations being generally followed by a detachment of the cuticle and rete mucosum.

Another effect of inflammation is, to deprive certain textures of their natural transparency, a charge noticed with remarkable fre-

---

* See Macartney " On Inflammation," p.17. " That there may be no deception with regard to the degree and nature of the red color and vascularity of parts after death, it is of great importance that they be examined immediately they are exposed to view, as, under the influence of the air, those which are almost pale become reddened, or, if slightly red, become much redder, in the course of a few hours." Thus also venous and vascular congestion may put on the appearance of inflammation. See Carswell's " Elementary Forms of Disease."

quency in disease of the eye. If a portion of inflamed arachnoid coat of the brain be examined while extended over that organ, the *loss of transparency* is particularly evident, where the membrane lies over the interspaces of the convolutions.

A common change, resulting from inflammation, is the *thickening of parts*; thus a piece of inflamed pleura or peritoneum, is always found to be so altered. Indeed, "an *increase of bulk*, thickness, swelling, or tumor, always accompanies acute inflammation."

Several of the above facts are finely illustrated in a preparation, preserved in the museum of the Royal College of Surgeons. John Hunter froze the ear of a rabbit, and thawed it again: a considerable inflammation of it ensued. The animal was now killed, the vessels of the head injected, and both ears removed and dried. The ear that was not inflamed, retains a clear transparent appearance, and its arteries are of the natural size; but the ear that suffered inflammation is opaque, and considerably thickened, with its arteries much enlarged. Dr. Macartney produced inflammation of a rabbit's ear by scalding it, and the only difference in the result was, that there was more dilatation of the branches, and less thickening of the auricular artery, than after Hunter's experiment.

The *swelling* and *tension* of inflamed parts arise partly from the dilatation and turgescence of the blood-vessels, partly from the extravasation of fibrine, serum, and sometimes even of blood from the rupture of the over-distended vessels; partly from the thickening of tissues; and partly from the interruption of absorption. The degree of swelling depends in a great measure on the violence of the inflammation, and the kind of tissue affected. In some inflammations of the eye, and in all superficial imflammations of mucous and serous tissues, there is little or no swelling; but, in inflammation of the testicles, phlegmonous inflammation in general, phlegmonous erysipelas, and the state of the eye termed *chemosis*, the swelling may be prodigious.

The interstitial effusion of limpid albumen, or serum, constitutes œdema, and one of the early effects of nflammation. "It frequently remains in the form of a pale and colorless swelling, after the vascular repletion and the consequent redness have disappeared. In one case, inflammation of the larynx, it is frequently the cause of death, obstructing the upper orifice of the larynx, and suspending respiration."*

One important physical character of acute inflammation, correctly explained by Professor Carswell, is a *diminution of consistence*, or rather of *cohesion*, of the organic elements of the inflamed part. "This change commences in the first stage of inflammation, and may proceed to such a degree in the second, as to render even the bones soft and fragile, and convert all the tissues into a mere pulp.

---

* See Dr. Hall's "Principles of Medicine," p. 9.

It appears to affect the uniting cellular element, more than any other, of tissues and organs; and to do so in proportion to the degree of inflammation by which it has been preceded."

An opposite condition, that of *induration*, is a frequent consequence or accompaniment of *chronic inflammation*. "It differs from the solidification of acute inflammation in this, that there is at the same time increased cohesion of the anatomical elements of the affected part."*.

According to Mr. Hunter's experiments, the *temperature of inflamed parts*, as indicated by the thermometer, is much lower than what might be expected from the consideration of the patient's own feelings and representations. By artificial means, he excited inflammation in the chest of a dog, and in the abdomen, rectum, and vagina of an ass, without being able to detect with a thermometer any material rise in the temperature of those parts. In one patient, however, on whom he operated for a hydrocele, the rise was more remarkable; for the temperature within the tunica vaginalis, which was only 92 degrees directly after the operation, rose on the following day to 98 3-4. Later investigations prove, that the heat of inflamed parts is sometimes as high as 107 deg.

It is not easily decided "how far the increased heat of inflamed parts depends on the higher degree of sensibility, or on the state of circulation and impeded secretion; since we find, that the temperature is most augmented, when inflammation affects those tissues which are the seat of active circulation and secretion. The inflammation of bones, tendons, and ligaments, which receive in a natural state few blood-vessels, and which furnish no secretions, is attended with very little increase of temperature; while the skin and mucous membranes have their heat greatly exalted during inflammation. It should nevertheless be considered, that these surfaces are most richly supplied with nerves, as well as blood-vessels." My friend Dr. Macartney, however, from whose writings I have borrowed the foregoing passage, is disposed to ascribe the increased heat of inflamed parts more to their state of local or organic sensibility, than to the condition of their arteries, as regards circulation or secretion. On the other hand, Dr. M. Hall inclines to the doctrine, that it is owing to the augmented quantity of blood in the part. The *varieties of pain* from inflammation depend partly on the character of the inflammation, and partly on the texture of the inflamed parts.

The *pain* is throbbing in phlegmon, but of a tingling, burning kind in erysipelas; it is acute in parts largely provided with nerves, and this more with reference to their number than their size. In parts of a dense, unyielding texture, the pain is likewise extremely severe, though they may not abound in nerves. This fact is exemplified in the generality of fibrous textures. In bones, the pain is aching, and in ligaments it is of a similar kind. In inflammation of parts bound down, or surrounded by a dense, unyielding fascia, the pain is always great. Inflammations of serous membranes are well known to be more acutely painful than those of mucous ones.

---

* See Carswell's "Elementary Forms of Disease." Fasciculus 1.

Amongst the *effects* of inflammation are those *produced in the secretions* of the inflamed part. When inflammation of mucous or serous surfaces is slight, the secretions may be increased; but, if it attain a somewhat greater degree, they are not only more copious, but altered in their quality, becoming of a thicker consistence, and assuming the appearance of pus. "Thus the serum of blisters, when the skin is much irritated, is found to be coagulated; and the cutaneous secretions of the eyelids, ears, and other parts of the skin, are changed into a glutinous adhesive fluid. When parts are excessively inflamed, whether they are situated externally or internally, secretion of every kind is stopped. Even the secretion of pus ceases, when an abscess, an ulcer, or an issue, is suffering a severe degree of inflammation."*

According to John Hunter, inflammation is not merely an action of the smaller vessels of the part itself, but of the larger ones leading to it. In a whitlow, the pain and swelling may be confined to the end of the finger; yet, the digital arteries may be plainly felt to throb through their whole course with unusual force; and, in severe cases, even the radial and ulnar arteries participate in the same disturbance. These facts are sometimes regarded as proofs of the arteries contracting with increased force in inflammation; yet John Hunter, who first particularly adverted to them, never ventured to draw such conclusion himself; but only that the arterial system was dilating itself, and allowing a greater quantity of blood to pass.

In all examples of common inflammation, its degree is greatest in the direction towards the surface of the body. It seems as if it had a tendency to spread outwards, and to avoid the deep-seated parts. Thus, when the irritation of a bad tooth excites inflammation of the gums, there is generally but little pain and swelling on the side of them towards the tongue, but a great deal towards the cheek or lips. Mr. Hunter regarded this disposition of inflammation to extend towards the surface, and not the interior of the body, as an established law or principle in the animal economy, the usefulness of which in promoting the cure of many diseases must be sufficiently obvious.

Every inflammation of much extent or violence, or affecting parts of high importance, is attended with a general disturbance of the whole constitution, called the *sympathetic* or *symptomatic inflammatory fever*, of which the symptoms run as follows:—Pulse frequent, strong, and full: many of the secretions changed, diminished, or suppressed: hence, dryness and heat of the skin, a parched state of the mouth and fauces, and oppressive thirst; urine scanty and high-colored; and constipation.[*] Nervous system disordered; appetite lost; patient anxious, restless, and sleepless; headache; sometimes twitches of the muscles; wandering and confusion of the intellects; or actual delirium. This fever furnishes an illustration of what Mr. Hunter used to call *an universal sympathy of the body* with the disturbed condition of a part of it. The symptoms are always modified by the extent and violence of the inflammation and its situation in common tissues, or organs of the first-rate importance to life. When the latter are affected, the pulse is observed to be quicker and weaker than when only skin, cellular or muscular tissue, or other ordinary textures, are inflamed.

---

* Macartney, op. cit. p. 21.

The symptoms are also modified by the nature of the constitution itself; and hence, in naturally irritable subjects, they rise to a greater height, and often assume a more alarming character, than in individuals of better stamina. Females being generally more irritable and nervous than men, are liable to experience from local injuries greater constitutional disturbance than the latter, unless these happen to be of intemperate habits. Fat, corpulent persons, not in the custom of taking proper exercise, bear local injuries and inflammation, as well as disease in general, very badly; and hence in them the sympathetic inflammatory fever often prevails with extraordinary severity. But there is a particularly irritable temperament, frequently accompanying a countenance in which the cheeks exhibit a peculiar ruddiness, terminating very abruptly at the circumference, and presenting the ramifications or streaks of minute vessels, more plainly than in the fine complexion of youth, health, and a sound constitution. Individuals, with the ruddy kind of cheek here described, do not undergo disease favorably — in them inflammation is not disposed to be mild, nor the constitutional disturbance to be free from severity.

Speaking of certain inflammations, and not of the healthy or phlegmonous kind, the nature of the exciting cause has a powerful influence on the character of the constitutional symptoms. This is manifest in cases of poisoned wounds, whether received in dissection, or caused by the bites of venomous animals. Here we have the most dangerous forms of constitutional disturbance, though not always entirely corresponding to the extent of the local inflammation, since the poison itself, when the bites of snakes are concerned, has a chief influence in determining the severity of the effects upon the whole economy.

---

[*] In the *first stage* of inflammation, "the temporature is variously and greatly increased; the function of secretion is also for a time argumented: in glandular organs, however, only at the commencement; in serous tissues, for a much longer period, and to a much greater degree." In the second stage; the blood ceases to circulate, coagulates, and assumes a dark color; the temperature sinks; and secretion, absorption, and nutrition, are finally interrupted. See Carswell's "Elementary Forms of Disease," p. 1.

Besides the *common* local and constitutional *smyptoms of inflammation*, there are *particular* ones depending upon disturbance of the functions of the organs affected. Thus inflammation of the brain is attended with delirium, vertigo, coma, convulsions, or paralysis. Inflammation of the eye, with interruption or disorder of vision. Inflammation of the urethra, or bladder, with pain and difficulty in making water. Inflammation of the fauces, pharynx, or œsophagus, with pain or inconvenience in swallowing. Many diseases are not restricted to the production of changes of texture, or to derangement of functions: they seem often to bring about, and even more or less to consist in, changes of the fluids, as well as the solids. We know that the effects of inflammation extend to the blood itself; for, when taken from the veins of a person laboring under an attack of inflammation, sufficiently severe to disturb the constitution, it coagulates in the basin more firmly, and, according to John Hunter, more slowly, than usual; and a stratum of fibrine, of a yellowish buff or slightly greenish color, or very similar in appearance to size or glue, is left upon the surface of the crassamentum, which often floats in an extraordinary quantity of serum. The yellow substance is termed the *inflammatory crust*, or *buffy coat*. Such *blood* is also called *sizy*, or *cupped*, &c.; the surface of the crassamentum being concave at the centre, but frequently contracted and puckered up at the edges. The inflammatory crust varies in in thickness from a line to an inch or two, and consists of pure fibrine, deprived of the coloring matter, and mixed with a proportion of serum, which is found to contain nearly twice as much albumen as the serum in a healthy state of the system. Great analogy, therefore, prevails, both in appearance and in chemical composition, between the buffy coat of the blood, and the coagulating lympth or fibrine that constitutes false membranes. When the buffy coat is thick and compact, there is a proportional diminution in the firmness of the crassamentum. The cupped appearance, however, and the firmness both of the buffy coat and the entire coagulum, are usually proportionate to the strength of the patient and the severity of the inflammation, and greater in the inflammation of certain textures, such as serous membranes and fibrous tissues, than others; being then even more buffy than in inflammation of vital organs. The buffy coat is not confined to venous blood, but formed also on arterial blood. Thus, when in urgent inflammatory diseases, on account of the youth of the patient, and the small size of his veins, it is considered necessary to open the temporal artery, the blood exhibits a sizy appearance.*

---

* Dr. Davy is led by his experiments to think, that the coagulation of blood in in-

The buffy coat merits particular attention, because it is to a certain extent a criterion of the existence of inflammation, and a vindication of the employment of means calculated to subdue it. Inflammation frequently occurs in deep situations, completely out of the reach of manual and ocular examination; and then the case may be obscure and doubtful, while the life of the patient may entirely depend on the decision for or against the use of the lancet. The doctrine of the buffy coat being a criterion of the existence of inflammation, is to be received, however, with limitation; for, though the buffy coat generally occurs in blood taken away from patients laboring under inflammation, it sometimes presents itself when no inflammation exists. Blood taken from individuals laboring under plethora, or such as are accustomed to bleed at particular periods as a measure of precaution, is mostly buffy and cupped. Certain nervous disorders, unconnected with inflammation, are attended with sizy blood. In pregnancy, and in individuals who keep watch in the cold nocturnal air, the blood exhibits the same appearance. Again, the buffy coat is sometimes absent, when inflammation is unequivocally present[*] Sometimes what is first drawn is not buffy, but what follows is so. In proportion as the vessels are unloaded, the blood acquires more disposition to coagulate: thus, the blood, drawn in cases of acute internal inflammation, often does not afford so firm a clot as that of subsequent bleedings, although the inflammation may be lessened.[†] Some practitioners even dwell more on the excavated concave surface of the blood than the buffy coat, as evidence of the existence of inflammation. In establishing the diagnosis, then, we are to consider the buffy coat as not altogether sufficient of itself to remove every kind of doubt or obscurity regarding the existence of inflammation, and are particularly to take into the account the *concomitant symptoms*, the *degree of fever*

---

flammation commences sooner, and is completed more quickly, than in health. Yet any circumstances, occasioning an *unusually rapid coagulation*, will prevent the formation of the buffy coat, such as a small opening in the vein, and the very slow escape of the blood from the vessel: this will sometimes account for the first quantity not being buffy, though what follows may have this appearance. The receipt of the blood in a flat cold plate, or letting the blood fall from a height into the basin, will also hinder the production of the buffy coat. During the first stage of inflammation, "the vital properties of the blood undergo a manifest increase. A greater quantity of fibrine is formed, the plastic property of which is increased; for, besides its rapid organisation, under favorable circumstances, it retains, when separated from the other constituents of the blood, its fluidity for a longer period, and contracts more firmly, than in the natural state." See Carswell's "Elementary Forms of Disease," Fasciculus 1.

[*] In some inflammations of mucous membranes, such as bronchitis, the blood frequently exhibits no buffiness, nor cupped appearance. When the blood is also greatly impoverished, and the constitution seriously reduced, the blood, during inflammation, instead of being buffy, will often present a dark red, jelly-like, and decomposed appearance; as is often exemplified when inflammation proceeds rapidly to mortification, or is attended with typhoid fever.

[†] See Macartney "On Inflammation," p. 145.

present, the *state of the pulse*, the *situation* and *kind of pain experienced*, and especially the nature of the *functional disturbance.*

In obscure cases, we may take away a few ounces of blood at first for examination, and by way of experiment. Sometimes great light is thrown on the case by some of the *common symptoms* of inflammation being accompanied by *particular* ones, or such as are often termed *proper*, *essential*, and *pathognomonic symptoms.* Thus, severe pain in the loins might arise either from rheumatism, or from an inflammation of the kidneys: but, if vomiting and retraction of the testicle were to be amongst the other symptoms, with fever, &c., the inference would be, that the case was one of nephritis.

The *causes of inflammation* are divided into *predisposing*, *exciting*, and *proximate.* The human body is naturally susceptible of inflammation; and, if this were not the case, a recovery from many injuries and diseases would be impossible. In this point of view, inflammation is to be regarded as a salutary operation, the changes which it brings about being absolutely necessary for the restoration of the parts to the healthy and perfect state again. Now, although there is in the animal economy a natural susceptibility of inflammation, seemingly intended for beneficial purposes, some constitutions are more prone to inflammation than others, and sometimes acquire such a disposition to it as receives the technical appellation of a *phlogistic* or *inflammatory diathesis.* This unfortunate kind of constitution may be innate or born with a person; but it is much more frequently produced by circumstances, which rank as *predisposing causes.* One of the most powerful and common of these is *plethora*, or a *full habit*, arising from taking immoderate quantities of food, or, in plain terms, from eating and drinking beyond what nature requires, and can well dispose of. This practice of living above par, and frequently at the same time in a state of indolence, leads to a prodigious fulness of the vessels, and a fibrinous state of the blood, which not only create a predisposition to inflammation, but to the process being more severe and difficult to repress whenever it does occur.

The extraordinary quantities of porter and other fermented beverages, taken by certain classes of workmen in this metropolis, such as coal-heavers, draymen, and others, make these strong-looking men notoriously bad subjects for disease. I have attended great numbers of them, and my experience justifies me in saying, that they frequently die of slight injuries and diseases, from which less robust, but more temperate persons would rapidly recover. When individuals are known to have followed these habits, they are not in a favorable state to bear operations; for which they ought in general to be prepared by previous bleeding or purging, low diet, and proper regimen. Unfortunately for them, circumstances often give no time for preparation: they meet, perhaps, with bad compound fractures, and their limbs must be amputated without delay.

A sedentary, studious life, joined with habitual indulgence at table, invariably creates a strong predisposition to inflammation, and sometimes either communicates a gouty *diathesis*, or if such already exist from *hereditary* causes, brings it into action, becoming then the *exciting cause*. Among the predisposing causes, indeed, we should ever remember such peculiarities of constitution, because they explain why some individuals suffer from *gouty* inflammation; some from *scrofulous*, and others from *rheumatic;* though all of them may be living, perhaps, in nearly the same manner.

I believe, with Dr. Macartney, that a *local determination of blood*, as it is termed, is rather a *predisposing* than a *direct* cause of inflammation. When to much blood is sent to one part of the body, too little visits some other; the balance, therefore, may be disturbed by external cold repelling the blood from one part, and causing its flow in undue quantity elsewhere. Thus, cold applied to the skin of the abdomen, produces a determination of blood to the peritoneum and alimentary canal. A determination of blood to the head may be occasioned by circumstances which have not a similar effect on other parts, as passion, mental application, the exertion of the sight, and intoxication. A forced state of the circulation in the head gives a predisposition to inflammation of the membranes of the brain, the external parts of the nose, and the eyes.[*]

The *exciting causes* of inflammation are frequently mechanical injuries, fractures, bruises, wounds, &c.; stimulating applications, the contact of fire or heated substances, friction, and pressure on parts; the irritation of extraneous substances lodged in the textures or cavities of the body, as thorns, splinters of wood, bullets, fragments of bone, calculi, &c. One of the most common exciting causes is *cold*. In some instances, this seems to act *directly* on the part; as in inflammation brought on by it in the mucous membrane of the nose, larynx, trachea, and lungs. In other examples, cold acts *indirectly*, so as not to bring on inflammation of the part to which it has been applied, but of some distant organ. Thus, exposure of the feet to wet and cold will occasion in one person an inflammation of the throat, in another an inflammation of the chest, and in a third an inflammation of the bowels. Exposure to wet and cold, rubeola, &c., excite *internal* inflammation through the medium of the nervous and vascular systems.[†]

If a part, that has been exposed to intense cold, be suddenly warmed, the reaction is such as will bring on rapid and severe inflammation. In this way chilblains are excited, and large portions of the body destroyed by the quick advance of the inflammatory process to mortification. The cold may here be considered as the *predisposing cause*, and the sudden exposure to a warmer temperature the *exciting*.

---

[*] Macartney "On Inflammation," p. 79.

[†] Dr. M. Hall's "Principles of Medicine," p. 6. 8vo. Lond. 1837.

Fevers sometimes operate as *exciting causes* of inflammation, which comes on towards their close, and frequently produces abscesses, formerly named *critical*, from their being supposed to have a share in bringing the disease to a crisis. Constitutional causes likewise operate in producing boils, some kinds of whitlow, the tendency of erysipelas to gangrene in certain epidemics; the carbuncle of plague, the malignant pustule, and the gangrenous inflammations of the cheeks* and pudenda of infants.†

By the *proximate cause of inflammation*, is signified that state of the part upon which the phenomena peculiar to inflammation immediately depend; that secret process—that first essential action in the part, which constitutes the very beginning of inflammation, attends all its course, and is inseparably connected with its existence. The proximate causes of Galen and Boerhaave—viz., particular states of the fluids, viscosity and lentor of the blood, and the passage of the red globules into vessels not designed to receive or transmit them—even if they were facts, as indeed the latter one is, would not amount at all events to proximate causes, but only to predisposing and exciting ones. Whatever changes the blood may undergo in inflammation, they are now more justly regarded as effects, or at most as a predisposing cause, and not the proximate cause of inflammation. If the state of the whole mass of the blood were the cause, why should inflammation be confined to any particular part? Yet one fact here deserves to be particularly remembered, namely, that in plethora the blood is found to be buffy, which state unquestionably forms a predisposing cause of inflammation, but nothing more.

A larger quantity of blood is determined to an inflamed part than is sent to it in its natural state. If an incision be made in it, the blood gushes out more profusely, than from a cut in a similar part free from inflammation. If there be severe inflammation of the hand, and we open a vein at the bend of the elbow, the blood flows out much more rapidly than it would do from a vein of the other arm. This demonstrates a greater velocity of circulation, a more forcible current of blood towards the inflamed part, and also of the returning blood. Such facts cannot be explained by any reference to the action of the heart, an organ which drives the blood equally into the whole arterial system. They must depend either upon an increase in the diameter of the arteries of the part, or upon some power of the vessels themselves to transmit blood into the seat of the disorder with increased impetuosity and in larger quantity.

The capillary vessels are those by which the chief phenomena of inflammation are produced; such as the increased redness and heat of the part; the effusion of fibrine and serum; the formation of pus, when it happens; the swelling; the deposit of new or additional matter in the part; the pouring out of fluids from its surface or into its texture, &c.

---

* Pearson's "Principles of Surgery," and Dr. M. Hall, in "Edin. Med. and Surg. Journ." vol. xv. p. 547.

† Mr. Kinder Wood in "Med. Chir. Trans." vol. vi. p. 84.

The researches of Mr. Hunter proved, that the arterial branches acquire a greater power of contractility in proportion as they become smaller, and that the arterial trunks are less contractile and more elastic. That the minute ramifications of arteries are endowed with a high degree of contractility, is proved by a variety of circumstances. The minute arteries, like muscular tissues, retain the power of contracting after breathing has ceased: hence the empty state of the arterial system after death. When death is rapidly occasioned by lightning, or any violent narcotic poison, the action of the arterial and muscular systems being suddenly destroyed, the arteries are found filled with blood, as well as the veins. It is by the capillary vessels that the functions of *nutrition* and *secretion* are performed, and it is absolutely necessary for the uniform and uninterrupted continuance of these varied and highly important functions, that the vessels should have the power of controlling the motions of the fluids circulating within them.*

Some pathologists espouse the doctrine, that the changes which the vital fluid undergoes in its passage through the capillaries, whether these changes be for nutrition or secretion, have an important influence on its movement through them. However this may be, I would rather be content with the inference, that the capillaries possess a distributive power over the blood, so as at least to regulate the local circulation, independently of the heart, according to the necessities of each part.

The relative momentum of the blood in different parts of the body, or the quantity of the blood and its velocity, are perpetually varying, from the influence of the external stimuli or internal causes; facts, affording a decisive proof of the vital contractility of different portions of the arterial system. In *blushing*, the minute vessels of the cheek assume an increased activity, and admit more blood into them; while under the influence of depressing passions, such as fear, they are suddenly emptied, and the countenance becomes pale.

That in inflammation the diameter of the small vessels is after a time increased, so that red blood finds its way into many which naturally admit only a colorless fluid, and therefore cannot be seen at ordinary periods, is an undoubted fact. But, does the *increased action* in inflammation, of which we hear so much, signify any thing more than the action by which the diameter of the vessels becomes altered, a greater quantity of blood is transmitted to the seat of inflammation, fibrine is effused, redness, heat, and swelling are occasioned, fluids of various kinds poured out, and new products formed? Does it imply that the vessels are alternately contracting and expanding themselves in an extraordinary degree for the purpose of maintaining an accelerated flow of blood through the parts affected? Certainly not—with the naked eye we plainly see vessels dilated, but undergoing no alternate motion of dilatation and contraction. If, as Dr. Macartney rightly observes, the increased contraction were unremitting, it is the very state, to effect which is the object of many of the remedies employed; and, if it were alternated momentarily with the dilatation of the vessels, it would have more effect in driving the blood backward upon the great trunks, than onward through the minute termination of the arteries, unless the current were supported behind by valves[*]; neither if we can credit microscopical examinations, is the blood constantly pervading the smaller with increased celerity. On the contrary, the experiments[†] of Dr. John Thompson, Dr. Wilson Philip, Dr. Hastings, and Gendrin, all tend to prove that a quickened circulation of the blood in an inflamed part is so far from being an essential feature in the process, that when inflammation is established, when a certain stage of it has arrived, the motion of the globules in the minute vessels is retarded, or even stopped. Hence, Dr. Wilson Philip was led to adopt the hypothesis, that inflammation actually consists in a *debilitated state of the capillary vessels, followed by an increased action of the larger arteries.*

---

* Bichat, who did not attribute to the arteries any muscular power, assigned to them another property, which he named *insensible contractility*. Dr. Macartney, who believes in the positive and active extension and dilatation of arteries, and other tissues similarly endowed, acknowledges, that, at present, we have no term applicable to the movements, or spontaneous changes of form in non-muscular structure. "It has been called by some," he observes, "*tone*, or *tonicity*, which, if applied both to the dilatation, or excited state, and to the contraction, as the movement leading naturally to fixedness and quiescence, will be as suitable a term, perhaps, as any other that could be devised." In this sense he speaks of the *tone*, or *tonic action*, of arteries.

It is curious to notice the very opposite conclusions to which different parties are brought by the same facts: while the generality of medical writers, ancient as well as modern, admit the *doctrine of obstruction in the minute vessels*[‡] of an inflamed part, some of them refer it, with Boerhaave, to *vicidity* of the blood and *error loci* of the globules; some, with Cullen, to *spasm* of those vessels; and others, with Dr. Wilson Philip, to their *debility*.

---

[*] Macartney "On Inflammation," p. 126.

[†] With reference to such of these experiments as were made on cold-blooded animals, it is Dr. Macartney's belief, that, "in neither of the two classes of vertebrate animals with cold blood, is it possible to produce the genuine effects of inflammation." This doctrine, however, is disputed, and even vegetables are alleged to be liable to a state corresponding with inflammation. See "British and Foreign Med. Review," vol. vii. p. 429., and vol. viii. p. 188.

[‡] "It is probably by the partial obstruction to the circulation in the capillaries, that the minute arteries become enlarged, according to the well-known law, that muscular organs augment with obstacles to their functions." See Dr. M. Hall's "Principles of Medicine," p. 17.

With respect to increased alternate contractions and dilatations of the arteries in inflammation, Mr. Hunter never meant any such hypothesis to enter into his doctrines; for he distinctly says that "*in inflammation the muscular coat of the arteries does not contract.*"

Dr. Hastings takes the same view of inflammation as Dr. W. Philip, and represents it as consisting "*in a weakened action of the capillaries, by which the equilibrium between the larger and smaller vessels is destroyed, and the latter become distended.*"

A simple enlargement of vessels, and a mere irregularity in the distribution of the blood, will not constitute inflammation. We find that such changes occur in the spermatic arteries of animals which copulate only at particular periods of the year. We remark a similar change in the carotids of the stag, during the growth of its horns. Yet, in such examples, there is no inflammation, no pain, no redness. A simple increased determination of blood to parts may render their vessels preternaturally full and turgid—may produce what is technically named *congestion;* it may even be a predisposing cause of inflammation, but *it is not inflammation itself.*

The following is a summary of the principal changes occurring in the inflammatory process.

First stage, sometimes called *active congestion:**—1. Increased sensibility of the part. The nerves are essentially concerned, I think, in the first action of inflammation; but there is good foundation for the doctrine, that three elementary parts of the body have a constant share in the process—namely, the nerves, blood-vessels, and the blood itself. Animals, which have no visible nerves, and those in which the nervous system is very simple, exhibit, according to Professor Macartney, none of the phenomena of inflammation. All the local causes of inflammation seem to him to act by making such impressions on the sensibility of parts, as dispose the arteries to assume the inflammatory state.† 2. Increased action of the vessels—quickened circulation—increased influx of blood—dilatation of the small vessels and capillaries—admission of red blood into vessels previously colorless—turgescence—swelling—and then, a slow embarrassed circulation in the immediate seat of the inflammation.

If the inflammation continues, its *second stage* begins—it is no longer merely *active congestion.* The contractility of the vessels is paralysed by their over distension—the blood stagnates, and undergoes changes in its composition—the coats of the blood-vessels suffer injury—many of these vessels are ruptured—the action of others is changed; hence, the formation of new products—extravasation and effusion of blood—fibrine and serous fluid—thickening, and other alterations of tissues.

---

* The term *congestion* would not be deemed by Dr. Macartney the best, because his views lead him to regard congestion as belonging to the venous system, and actually accompanied by a diminution in the size of the arteries. Op. cit. p. 189.

† Op. cit. p. 111.; also p. 133., where Dr. Macartney endeavors to refute the objection to this view, derived from the fact of paralytic parts being liable to inflammation. "The paralysis," he remarks, "consists in the interruption of the communication between the central parts of the nervous system and those remotely situated, and not in the destruction of organic sensibility."

The phenomena of inflammation, then, as Dr. Carswell justly observes, cannot be explained by a reference to the exclusive doctrines of *increased*, or *diminished action*, of the vessels. "It is obviously a compound of both, and not merely of the vessels of the inflamed part, but *primarily* and *essentially of the function of innervation* also, of the vital properties of the blood, and, consequently, of organic composition."*

One view entertained of this subject is, that the *first* effect of a stimulus, calculated to produce inflammation, is on the general organic properties of the part, and especially on its power of deriving from the blood the materials of its assimilating or secreting processes; and that the influence it exerts on the calibre of the vessels, and on the motion of the blood through them, is altogether *secondary* to this. It is argued, that the effect of a stimulus, which increases for a time the physiological or normal actions of any part, is to accelerate the capillary circulation, whilst the calibre of the vessels is diminished. The latter alteration, it is thought, can scarcely be due to the direct application of the stimulus; but rather to the influence of the ganglionic nerves, which are unquestionably largely concerned in the subsequent processes. To the same influence the simultaneous dilatation of the arterial trunks leading to the part is referred.†

The following considerations have been advanced against the doctrine of the nerves being essentially concerned. "Is it true, that the impressions, which produce inflammation, necessarily act through the nervous system? We think not. To prove this, it must first be shown, that the normal changes, which constitute the organic functions, all of which are due to the influence of external agents on the organism, depend upon its influence. If a normal stimulus can produce a healthy change or action without the intervention of the nervous agency, it is perfectly evident, that an abnormal stimulus may produce a morbid change independently of it. The remark of Mr. Palmer upon this question strikes us as peculiarly judicious. 'The office of the nerves in inflammation appears to hold precisely the same relation to this action that it does to the other organic functions. It is regulative, but not essential.'" See British and Foreign Med. Review, No. 15. p. 188. I briefly notice this mode of reasoning, without adopting it.

In *chronic inflammation*, the vessels do not always exhibit the redness and turgescence noticed in the acute forms of the disorder. Yet, some times, a good deal of redness is attendant even on chronic inflammation of certain tissues; but, more frequently, "various shades of purple, brown, or black;" while the pain, the heat, the throbbing, the febrile disturbance, usually accompanying acute inflammation, are not noticed. Besides the tumefaction resulting from the deposit of morbid products; when inflammation is much prolonged, or often repeated, it causes an enlargement of parts by exciting an exuberant action of the nutritive vessels, and a consequent excessive nourishment, termed *hypertrophy*.

---

* See Professor Carswell's "Elementary Forms of Disease," Fasciculus 1.

† See "British and Foreign Med. Review," vol. viii. p. 191.

On the other hand, inflammation, by disturbing and interrupting the functions of circulation and nutrition in parts, sometimes has the effect of bringing an *atrophy*, or a wasted condition of them. These opposite results of inflammation are sometimes observed in parts composed of different structures: an exuberant nourishment of one tissue being generally attended with a deficient nourishment of other tissues of the same organ. By inflammation, the function of nutrition in parts may also be perverted, and then there may be *transformation of texture*—as into bone, cartilage, fibrous membrane, ligament, &c. *Acute inflammation* sometimes lessens the cohesion of tissues, and reduces them to a pulpy state, by a peculiar softening process. *Chronic inflammation* has a greater tendency to cause parts to become indurated. There are, however, many exceptions to these rules—and softening and induration are often combined.

Inflammation has various *terminations*. More properly speaking, after the process has continued a certain time, it either subsides entirely; or "new products are formed, or other diseased states are produced, as softening, suppuration, ulceration, and mortification." It may end in the adhesion of one inflamed surface, or texture, to another; induce in the vessels a disposition to form pus; bring on ulceration; or completely destroy the vitality of the parts.

[Cicatrization is another termination, for in this process all the Phenomena of Inflammation disappear].

When inflammation is about to end in the first manner, termed *resolution*, the pain becomes less, the swelling, tension, and throbbing subside; the redness fades away; the fever and every other symptom gradually abate; and, at length, the part is restored to its natural size and color. There is no formation of pus, and no permanent injury of structure. According to Kaltenbruenner, critical exudations take place through the sides of the vessels, consisting of a thin serous or sanguinous fluid, poured out on the surface, or in the cellular texture of the part. There may be profuse exhalation of fluids on secreting surfaces. The small coagula of blood, contained within the vessels, or deposited in the parenchyma, are softened, and removed either by the impetus of the current of blood within the vessels, or by interstitial absorption. This termination, which may be rightly called so, is fortunately not only the most favorable, but the most common.

A modification of it, characterised by a more sudden subsidence of all the logical symptoms, or by a rapid shrivelling and diminution of the swelling, is described by French pathologists under the name of *delitescence.*

Resolution is often preceded or accompanied by *metastasis*, or *translation of the disease* from one part to another. Thus, inflammation may suddenly leave one tonsil, and attack the other. In mumps, the glandular inflammation often suddenly recedes, and the testicle or breast is then affected. In gout, the inflammation leaves the foot, and attacks the hand or knee, or even the stomach or brain. Rheumatism, on quitting one joint, causes inflammation in another. Sometimes it leaves the joints, and fixes on the membranes of the brain, or the serous covering of the heart.

One frequent consequence of inflammation is *suppuration*, the vessels acquiring the power of forming purulent matter, which either collects in the substance of parts, so as to produce abscesses, or is poured out from their surface in the form of discharges, as illustrated in wounds and ulcers, and the inflammation of mucous membranes. *Suppuration* cannot be properly called a *termination* of inflammation, but only one of its effects or consequences. It is rather a modification of the inflammatory action, than a cessation of it. Indeed, when it occurs, the surrounding parts are frequently in the stage of common adhesive inflammation; and, so far from the disorder having ended, the suppuration may be attended with a severe degree of it.

Another termination, or rather consequence, of inflammation, is *ulceration.*

Mortification of the parts affected is the most dangerous and severe result; but it only takes place in inflammations attended with unusual violence, the debility of age or impaired constitution, or some specific peculiarity leading necessarily to the event, as is illustrated in carbuncle; and, upon a smaller scale, even in the common boil, in the centre of which there is always a core, or slough of cellular tissue. After *acute* inflammation has lasted a certain time, especially on a mucous membrane, it frequently changes into *chronic*, the part then becoming less painful, and the vessels generally less red, but seemingly relaxed, and, one would here almost venture to say with Dr. Wilson Phillip, debilitated.

Dr. Macartney believes, that the only direct and genuine consequences of inflammation are, the effusion of some of the fluid elements of the blood, *which cannot receive organisation;* the breaking down of some of the solid textures of the body; the formation of a new fluid, denominated *pus;* and the disorganisation, or the absolute death, of the inflamed parts. (Op. cit. p. 36.) The *effusion* of *coagulating lymph*, and *ulceration*, are not admitted by this gentleman to be the consequences of an inflammatory action. (p. 37. &c.) While I agree with him, that coagulating lymph may be thrown out by a natural and healthy action, as in the formation of the decidua uteri, it seems to me impossible to adopt the doctrine, that inflammation has not among its effects or consequences the effusion of that substance. With reference to ulceration, does not Dr. Macartney accede to the commonly received doctrine, when he says, " there is every reason to believe, that *ulceration always takes place*, because the vitality, or the organisation of parts, have been impaired by *inflammation*, weakness, pressure, or other external injuries? " (p. 42.) The questions concerning the salutary or pernicious results of such effusion, and whether it may not happen in certain natural processes in the animal economy, without inflammation, appear to me to relate to a different part of the inquiry.

TREATMENT OF INFLAMMATION.

Although, in many cases, inflammation clearly appears to be a process set up for beneficial purposes, and is to be regarded as salutary and even necessary; yet, more commonly, it happens, that, from its extent, its situation, or its violence, it cannot be considered in this light; and being then more likely to injure or destroy, than to serve the patient, it demands the prompt employment of every means calculated to check and subdue it. Consequences, the most serious and fatal, frequently arise from its attacks, when violent, of the great extent, or situated in organs of importance to life, or of great delicacy of texture, unless such attacks be resisted by active measures. Enormous abscesses sometimes form; the functions of important organs are permanently impaired or destroyed; and, what is worse, the patient frequently dies from the amount of local mischief and constitutional disturbance produced. If the bills of mortality were correctly made out, the greater number of deaths would be found to be caused by inflammation in some form or another. This is so true, that the words of Milton, in relation to the forbidden fruit, might, and indeed have been, applied to inflammation as having

> " Brought death into the world and all our woe."

But even when inflammation does not kill by its *violence*, its *extent*, or its *particular situation* in parts of first-rate consequence to life, it frequently gives rise to evils which can never afterwards be repaired. Thus it renders transparant textures opaque; it thickens, hardens, softens, or enlarges the generality of parts affected by it; it causes the effusion of a serous fluid, which does not coagulate spontaneously, and also of fibrine,—one character of which it is spontaneous coagulation, the latter sometimes becoming vascular and organised, so as to produce lasting adhesions of surfaces together, which ought to move freely upon one another, or at all events, not to be united. It also brings on ulceration and mortification. Now, by producing these changes, it often completely destroys the functions of organs, or so impairs them that they can only go on in a disordered, weakened, and imperfect manner. These facts are excellently illustrated in inflammation of the eye, where, if the disorder be not successfully resisted, we see opacities of the transparent textures produced; the pupil blocked up with coagulating lymph; the iris thickened, and rendered immoveable; or the cornea in an ulcerated or sloughing state, so as to occasion a discharge of all the humors, and a total collapse and destruction of the organ. In other inflammations of the eye, adhesions frequently take place between the iris and the inner surface of the cornea, or between the iris and the capsule of the crystalline lens. In fact, in the eye all the effects of inflammation are delineated in a manner that can never be forgotten: transparent parts rendered opaque; parts, which ought to be moveable, fixed by adhesions; textures surprisingly thickened and swollen; the white conjunctiva converted into one uniform vivid redness by the dilation of the vessels; and even the retina paralysed, and its functions irreparably destroyed. "The iris has its office destroyed by being bound to the adjoining parts; the actions of the heart are embarrassed by extensive adhesion between it and the pericardium; and (continues Dr. Macartney) I have known the general union of the peritoneal surfaces of the intestines cause strangulation of the whole alimentary canal, and death. It is also the agglutination by lymph, which is the most frequent cause of hernia becoming irreducible, and, occasionally, of the parts becoming strangulated. The effusion of lymph in the trachea during croup causes as much danger as the inflammation. So, likewise, when the bladder and urethra are blocked up with lymph." (p. 37.) Respecting the disadvantages, or the benefits, arising from adhesions in different examples of inflammation, Dr. Macarteny agrees with other pathologists. But if parts not merely valuable from their functions, like the eye, but absolutely essential to life, become attacked with inflammation, the necessity for active treatment is still more urgent. Thus, when the lungs, the larynx, the brain, the stomach, or the intestines are inflamed, if vigorous antiphlogistic measures be not speedily adopted, and the disorder be suffered to make progress, the patient will generally perish.

The fact, then, being established, that inflammation, so far from being always a salutary process, is sometimes an injurious and a fatal one, it becomes the duty of the surgeon to adopt, in every severe example of it, the most prompt and efficient means to oppose and subdue it.

" The nervous system of the human subject is so complicated, that there is hardly a local affection with which the constitution does not sympathise, nor any constitutional disturbance which may not become the cause of local disease. The same susceptibility, however, communicates a power to the means we may employ for preventing or abating inflammatory action, which (power) does not belong to animals of an inferior organisation; and when by those means we are enabled to remove the sense of injury sustained, or produce a state of insensibility inconsistent with inflammation, the reparative processes (seems to Dr. Macarteny to) go on much in the same manner as in animals endowed with an inferior degree of feeling."

Resolution being the most favorable termination of inflammation, is what should always be aimed at, unless it be known from the peculiarity and state of the disorder, that no chance of such termination remains. According to Dr. Wilson Phillip's theory, inflammation is attended with debility of the capillary vessels, and *resolution* is brought about by the increased action of the larger arteries removing this condition of the smaller ones. On the other hand, it might be argued, that such increased action of the arteries leading to the seat of inflammation must have the effect of gorging the minute vessels in a still greater degree, and that, if the foregoing view were correct, the principal object in the treatment would be to promote such increased action, which practice is inconsistent with the dictates of a general experience.

In the commencement, there are two principal indications. 1. To remove the exciting cause, if it be still present. 2. To lessen the determination of blood to the part.

With regard to the *exciting cause*, it may not admit of immediate removal, or its operation may have already ceased. Thus, when inflammation is caused by a mechanical injury done in an instant, the exciting cause continues not beyond the moment of its application, the instant of the infliction of the wound, but the mischief remains to be repaired, and this may be regarded as the exciting cause of the reaction which follows, and constitutes inflammation; it is manifest, however, that such mechanical injury of textures cannot be immediately removed, and, indeed, that it can only be gradually rectified by the inflammation itself. But, in many examples, the exciting cause continues in operation, as where sand or other extraneous substances are lodged between the eyelids and the front of the eye, or where a splinter of wood, a bullet, or fragment of gravel, &c., are lodged in parts; and, in such cases, it is absolutely necessary to remove them as soon as possible; for, until this be done, little or no benefit, or, at all events, no perfect cure, will accrue from any mode of treatment.

On the same principle, when pressure, friction, or the presence of urine or irritating fluids in the cellular tissue, is concerned in kindling inflammation and its consequences, the removal of such pressure, &c., and the making of a free outlet for the extravasated urine, are primary objects.

The second indication is *to diminish the flow of blood to the inflamed part*, by which means the surgeon removes, in a great measure, that by which the disease may be said to be fed. The fact being once established, that inflammation is kept up by an increased flow of blood to the part, this indication presents itself as a matter of course, nor can it be affected by any consideration of the exact state of the capillary vessels, or of the rate of the blood's motion in them. Nay, were it right to be altogether influenced by the presumed debilitated condition of these vessels, I should argue, that the indication of diminishing the flow of blood to them would still be the most consonant to reason as well as experience. It is fulfilled either by plans which act directly on the part affected, or by others which act indirectly upon it, that is to say, through the medium of the constitution. There are also other means, which operate on a different principle, viz., on that of the sympathy existing between different organs. Counter-irritation is a remedy of this kind, which is often of essential service when employed with due precaution. The first means, namely, those which operate *directly* on the part affected, are denominated *local* or *topical;* and the second, or those which act *indirectly*, are called *general* or *constitutional.* The *local* consist of *bleeding*, by means of *cupping* or *leeches*, the application of *cold lotions*, *emollient poultices*, *fomentations*, and, especially after depletion has been duly practised, *blisters.*

In all acute inflammations of any extent or violence, bleeding from a large vein, or the temporal artery, should be practised, and in such a quantity as to produce an effect upon the whole system. The taking away of blood from the system is what the experience of many generations pronounces to be the great *antiphlagistic remedy*, most entitled to reliance; and this is so strictly the fact, that the preservation of life often depends, not only upon blood-letting being speedily and freely performed, but upon its being repeated as frequently as circumstances may require. In inflammation of the brain, lungs, larynx, pleura, peritonæum, stomach, or bowels, the patient must be bled, and this promptly, copiously, and sometimes repeatedly, or life will be lost in a few hours; indeed, to omit blood-letting in such cases would be to leave the patient to the poor chance of an accidental or spontaneous recovery. If there were no blood vessels in parts, or if there were no blood in the vessels, there could be no inflammation; and if to these truisms, a statement equally certain be taken into the account, namely, that the continuance of inflammation depends on fresh supplies of blood sent to the part affected, the reason for lessening the mass of blood in the circulation must be manifest. By so doing, the action of the heart and arteries is moderated, and in proportion as the force and velocity of the whole circulation are reduced, the impetus of the blood flowing to the seat of disorder, is also diminished. Indeed, if there were not thousands of other examples to convince us of the great usefulness of blood-letting in the cure of inflammation, there is one case, which of itself could never leave any doubt on this important point. If, in severe inflammation of the eye, attended with great redness of the tunica conjunctiva, blood-letting be practised, the redness visibly diminishes in proportion as the blood is abstracted; the color, which at first was scarlet, a complete sheet of vivid redness, becomes a pale pink, the vessels shrink, and their redness and turgescence are sometimes almost removed by the time thirty or forty ounces have been taken away. When we bleed, then, in opthalmia, we have something like a demonstration of the benefit of blood-letting. In wounds of the head, chest, or abdomen, the chief danger, when the patient is not destroyed at once by internal hemorrhage, is from the supervention of inflammation of vital organs; and, if the patient were not duly bled on the first signs of that disorder making their appearance, he would soon die. In all such cases, the rule is to bleed expeditiously, freely, and repeatedly, not to be content with taking away scanty quantities of blood, and not to be deterred by smallness of the pulse, or other appearances of weakness.

Bleeding is not always necessary in slight inflammation of common parts—I say of *common parts*, because in *important parts*, however *slight* the inflammation may be, bleeding should not be omitted. It is necessary also to consider the *age*, the *strength*, and the *constitution* of the individual. It must be evident, that an aged or weak person will not bear depletion to the same extent as a young or robust individual; yet, notwithstanding the general truth of this proposition, when we are called upon to check an inflammation of any important part, whether the patient be old or young, weak or strong, the principal reliance must be upon blood-letting. A small quantity, however, abstracted from weak aged individuals, is equivalent to a larger quantity taken from the strong. The fact of the usefulness of bleeding for the relief of inflammatory complaints is so well established, that, in every severe instance, we are to employ, not merely *general bleeding*, but also *topical* or *local bleeding*, by means of *cupping* or *leeches*.

There are, however, some constitutions, not essentially joined with old age or debility, but characterised by excessive nervous irritability, and well known to be incapable of bearing bleeding to any considerable extent. This fact is particularly adverted to by Andral, who observes that in individuals, who, during the course of an acute inflammation, have already lost a considerable quantity of blood, or who, during a tedious convalescence, have been kept for a long time on a low diet, and in others, who, after a severe attack of acute inflammation, continue to be afflicted with a lingering chronic form of it, the nervous system is apt to become violently disturbed by the abstraction of even the slightest quantity of blood. Hence the kind of constitution, and the previous history of the case, are always to be taken into consideration, and measures adopted accordingly. With respect to these nervous irritable temperaments, if bleeding be useful at all in them, it is generally only in the beginning of the inflammation, and, if this opportunity be lost, the practice will not avail afterwards.

In the correctness of the following remark I fully concur. "It is a common practice to draw blood the moment an injury is received, long before there is time for inflammation to set in. This (says Dr. Macartney) appears to me to be worse than useless, as it deprives the practitioner of the opportunity of acting with sufficient energy when the proper time arrives."* Cases of accident, that of fractured ribs, for example, are sometimes suspected not to bear loss of blood like those of inflammation. According to Dr. M. Hall, different diseases induce in the constitution different powers or susceptibilities, in regard to the effects of loss of blood. In cases in which it is doubtful, whether the pain, or other local affection, be the effect of inflammation, or of irritation, "the question is immediately determined by placing the patient upright, and looking upwards, and bleeding to incipient syncope. In inflammation, much blood flows; in irritation, very little. The violence of the disease, the powers of the system, and the due measure of the remedy, are determined at the same time." In inflammation, we are to bleed fully; in irritation, cautiously: if much blood flows before syncope occurs, we may suspect inflammation; if little, however similar the symptoms, Dr. Hall would suspect the case to be of a different nature, perhaps irritation, or exhaustion.† Exceptions to this mode of judging, however, are admitted, and every experienced surgeon must have met with them.

I have already referred to the instruction to be derived from the appearance of the blood taken away; viz. from its buffy and cupped surface; but since these circumstances are not entirely to be depended upon as a criterion of inflammation, and of the necessity for venesection, the surgeon must reflect upon the *state of the pulse*, the *type and degree of fever* present, the *kind of pain* experienced, and the *nature of the function disturbed*. He should likewise pay attention to the character of the *sympathetic* symptoms, as they are termed, such as pain in the shoulder and about the larynx in hepatitis, the vomiting and retraction of the testicle in inflammation of the kidney, &c. From all these considerations taken together, he will generally be able to judge of the *existence*, *extent*, *violence*, and *seat of inflammation*, and form a correct opinion about the propriety of taking away blood.

In urgent cases, it is sometimes advisable to bleed the patient till he faints, *ad deliquium*, as the phrase is; because, when a person faints, all operations in the system are immediately checked or suspended, and among them the action or process of inflammation.

---

* Op. cit. p. 152.

† Principles of Medicine, p. 79.

Now, for the purpose of inducing *deliquium*, it is frequently proper to make the opening in the vein large, or even to puncture a vein in each arm, so that the blood may flow away more suddenly; for, on the quickness of the evacuation, the success of the attempt will often depend. If the patient be not too ill, it is also sometimes deemed advantageous, with a similar view, to bleed him while he is standing or sitting up in bed, because in these postures half the quantity requisite to make him faint while he is lying down will have the effect. By attending to these directions, inflammation may often be reduced at once, with a very inferior loss of blood to what would be required, if this fluid were taken away in the first instance in a more gradual way.

The plan of bleeding from a large orifice, or from two veins, is only to be adopted in urgent cases, and where the patient is in a state to bear fainting without danger. After fainting commences, the surgeon should always stop the further flow of blood, lest the prostration of the vital power be carried to a dangerous extreme. When, from our acquaintance with the patient's constitution, we know that the loss of an ounce or two of blood will make him faint, we should bleed him in the recumbent posture, and make an opening of moderate size in the vein. Without these precautions, we might not be able to take away blood enough to make any impression on some dangerous forms of inflammation.

Local or *topical bleeding* is employed in mild cases, and in the chronic forms of inflammation, where the opening of a large vein is not deemed necessary; and it is likewise resorted to in inflammations which are dangerous on account of their degree or situation, as an auxiliary to venesection, or arteriotomy; but, in such instances, the use of the lancet should never be omitted. So long as plethora has not been duly obviated by general bleeding, topical bleeding will disappoint the expectations of the practitioner; and alone, it will mostly fail to stop the progress of any important inflammation.

Topical bleeding will suffice where the symptoms are not severe enough to require general bleeding, or where, on account of peculiar circumstances, the system will not bear much loss of blood from the arm, or where doubts exist about the propriety of venesection, inasmuch as the nature and state of the disorder may be questionable. Local bleeding, by means of leeches and cupping, is also frequently of considerable service in those inflammations which partake more of the chronic than the acute form. To some parts, after the leeches have fallen off, a cupping-glass may be applied, by which means the discharge of six or eight ounces more blood may often be promptly obtained. In general, when plethora has been obviated, the effect of topical bleeding will prove to be much greater than could be expected from the simple consideration of the moderate quantity of blood often thus taken away. Some pathologists account for this fact by supposing the smallness of the evacuation compensated by the nearness of the bleeding to the part affected, the effect being concentrated, as it were, on that particular part.

By cupping freely, or applying a great number of leeches, however, sufficient blood may be taken away to produce a vast effect upon the system at large. These modes of bleeding may then indeed be regarded in the same light as venesection, or general bleeding.

In some constitutions, leeches must be avoided, as invariably bringing on an attack of erysipelas.

The *symptomatic fever*, which accompanies every severe attack of inflammation, always produces constipation. *The removal of this confined state of the bowels*, then is, *another indication*. For this purpose, mild saline purgatives, which act without much irritation, are sometimes preferred, as the sulphates of soda and magnesia, and the tartrates of potash and soda. In many cases, however, more active purgatives become necessary, such as colocynth with calomel, or calomel with jalap, James's powder, &c. It may be proper also to assist the operation of these last medicines with the infusion of sena, or the saline mixture, in which a proportion of some of the neutral salts has been dissolved. In certain instances, the aid of glysters is also requisite. Purgative medicines have a considerable effect in lessening the strength and frequency of the pulse, and in reducing the force of the circulation; and, on this principle, they must be of service in subduing inflammation; they cause an extraordinary secretion from the whole surface of the mucous membrane of the bowels; and when the immense extent of that surface, and the quantity of fluid, thus abstracted from the circulation, are recollected, we must at once recognise the manner in which purgatives become so beneficial as a means of counteracting inflammation.

Amongst the remedies which act through the medium of the constitution, is *mercury*, the powerful effect of which, in stopping the effusion of coagulated lymph in inflammation, is a very important fact, made out within the last thirty or forty years. The exhibition of calomel, joined with opium, in the treatment of certain visceral inflammations, was first particularly recommended to the notice of the profession, at an earlier period, that is in 1783, by Dr. Robert Hamilton of Lyme Regis. The effect of mercury in stopping the effusion of fibrine or coagulating lymph, and promoting its absorption when already effused, was first brought into great publicity by the late Mr. Saunders and Dr. Farre, whose statements were deduced from the observation of the action of mercury on iritis. Another illustration of the power of mercury in checking the progress of inflammation, and especially in preventing that action of the vessels on which the effusion of fibrine depends, is seen in inflammation of the larynx, or croup. Here the chief reliance is on the lancet, and the free exhibition of murcury; for if the inflammation be not quickly stopped, and its consequence, the effusion of lymph, be not rapidly checked, the death of the patient will be inevitable: he will die partly from the obstruction of the air passages with fibrine, and partly from the glotis becoming œdematous.

Mercury exerts a similar beneficial influence over inflammation of the viscera and internal organs in general, and it has a peculiar power of controlling the process, so as to prevent those changes from taking place which are so destructive to the organisation of tissues in a state of inflammation. The quantity, which is to be administered, must depend on the violence of the inflammation, and on the nature of the parts affected. Sometimes it is necessary to bring the system rapidly under its influence, as for example, in inflammation of the iris, the retina, the larynx, or the trachea. In such cases, immediately after general and local bleeding, we may give two or three grains of calomel, or five of the hydrargyrum cum creta, every alternate hour, till there be some decided affection of the mouth, and amendment in the symptoms. Even larger doses are sometimes given. In the inflammatory diseases of hot climates, which run their course with frightful speed, the rapid introduction of murcury after venesection seems to be the only chance of saving life.

Though mercury has vast effect in arresting the progress of inflammation, when exhibited alone directly after bleeding, it is often more successful when combined with opium, especially if the pain is severe, and there is a tendency to disturbance of the bowels. Here, sometimes, the hydrargyrum cum creta, joined with the compound powder of epecacuanha, is the best formula. In active inflammation, however, neither mercury, nor any other remedy, should be permitted to interfere with blood-letting, which is the first and most powerful means of stopping inflammation, while mercury, perhaps, deserves to rank as the second; or, as Dr. Armstrong used to say, bleeding is the right arm in the management of inflammation, and mercury the left.

But, though mercury is useful in the treatment of inflammation situated in various important organs and textures, it is by no means necessary to put patients under its influence for the relief of every common case of inflammation. This would be making the remedy worse than the disease. There are likewise particular states of the health, brought on by the too free or long employment of mercury, or other causes, in which any inflammation present will not take a favorable course until the state of the constitution has been improved. Here the discontinuance of mercury, instead of its further exhibition, may be the principal means of benefitting the patient.

Tartarised antimony is useful in two ways; first, by lessening the dryness of the skin and promoting perspiration; and secondly, in freer doses, by producing nausea, which at once renders perspiration more abundant, and reduces the force of the pulse. No doubt considerable benefit sometimes arises from its employment with these views, as well as from its efficacy in promoting the alvine evacuations; but if we were to depend entirely upon it, if we were to lay the lancet aside for it, I should say, that it would not generally be for the patient's good: the practice would not be less severe, and perhaps inferior in point of efficacy. In Italy, the plan of giving very large doses of tartarised antimony for the cure of inflammation has been common of late years. Thus, in pneumonia, Rasori, one of the advocates for this plan, gave, after blood-letting, not less than eight or ten grains of this preperation in the twenty-four hours. If the disease had made considerable progress in the lungs, he began with twenty or thirty grains, increasing the dose daily till one or several drachms had been taken in the course of the twenty-four hours. Of 832 cases of pneumonia, treated in this manner, only 173 died. Laennec, encouraged by these facts, also employed the same medicine *after bleeding*, but, in the more moderate dose of one grain every four hours, blended with about a drachm and a half of syrup of poppies. Dr. Tweedie finds the irritation of the stomach, resulting from it, very much allayed by giving it in the effervescing saline draught, with a few drops of laudanum.

For many years past, surgeons have occasionally been in the habit of treating violent inflammations of the eye and testicle by means of nauseating doses of tartarised antimony; but partly in consequence of the aversion of most patients to be sickened in this way, and partly from the greater confidence now placed in mercury, the practice has of late considerably declined.

Colchicum, as a diuretic, purgative, and nauseating medicine, is useful, but chiefly in some specific inflammations, like those of gout, rheumatism, and some forms of inflammation within the eye, connected with peculiar states of the system.

Opium, being a stimulant and a constipating medicine, as well as a narcotic, has sometimes been deemed quite inapplicable to cases of inflammation. Yet, at all periods, it has had its advocates. In examples, accompanied by excessive pain, some practitioners, after bleeding the patient largely, give a full dose of opium, which is sometimes followed by the most happy effects, especially in irritable constitutions. The reaction, which often follows a large bleeding, may generally be prevented by giving two grains of solid opium, or a draught containing one grain of pure acetate or muriate of morphia, administered when the faintness is disappearing. In many instances, one copious bleeding, a full dose of opium, and a mild cathartic, will succeed in stopping inflammation. The opium so tranquilises the nervous system, after the bleeding, that the patient often falls into a refreshing sleep, from which he awakes with a moist skin, and a freedom from pain. If, however, after an interval of three or four hours, the skin should become hot and dry again, and the pulse wiry, the blood-letting and opium, with three or four grains of calomel, are to be repeated.

In the treatment of inflammation, the severity of the pain frequently compels the surgeon to prescribe opium. When suppuration is taking place in situations where the parts and the matter are bound down by tense unyielding structures, the agony may be intolerable. After a surgical operation, when the wounded parts continue inflamed, and more blood cannot be taken away, the surgeon may sometimes give one grain of opium and two of calomel every six or eight hours, with great advantage.

Differences of opinion exists about the general usefulness of giving opium just before and immediately after surgical operations. When the pain after an operation is exceedingly severe, the patient very restless and nervous, with a disposition to spasms or subsultus tendinum, the acetate or muriate of morphia may be prescribed. But the dose must be a full one, that is to say, a grain; for all surgeons of experience agree, that small doses of any preparation of opium, after a surgical operation, only render the patient more uncomfortable and feverish. If laudanum be given, it should be in doses of fifty or sixty drops.

With *bleeding*, *purging*, *antimonials*, and *sometimes mercury* and *opium*, are to be be combined the advantages of a very *low diet*, from which all animal food, spirits, wine, and fermented liquors in general, must be strictly excluded; often, indeed, only barley-water, or lemonade, or tea, with a bit of dry toast, ought to be allowed. Quietude of body and mind is to be enjoined, and every thing avoided likely to stimulate the system, accelerate the circulation, or disturb the nervous system, or the inflamed part itself. The return of blood from the seat of inflammation may sometimes be advantageously promoted by a judicious position of the part. To borrow Dr. Macartney's language, where he is speaking of the immersion of a wounded or inflamed part in warm or cold water, freedom from the sense of restraint, pressure, and friction, an easy and elevated position, and avoidance of all motion, are advantages acknowledged by every body. The patient should be placed in a quiet apartment, in which there ought to be no unnecessary conversation, nor any superlative visitors. The room is to be kept moderately cool, and the patient not heated with heavy blankets. The several measures and plans, here mentioned, constitute what is called the *antiphlogistic treatment*, which is applicable to the relief not only of common but of specific inflammations, though in these latter cases other remedies are mostly required.

Local or *topical remedies for inflammation.*—One effect of this process, in all its acute forms, is to produce a rise in the temperature of the parts affected: not only does the patient experience in them a distressing sensation of heat, but their temperature is actually proved by the thermometer to rise several degrees above what it is in their quiet and healthy state. Now, we should probably be inclined to adopt measures for the relief of this symptom, if it were only for the purpose of freeing the patient from the uncomfortable state in which he is placed by it; but there is another and a still more important reason for doing so. Heat promotes every process going on in the system, and the process of inflammation amongst the rest; therefore, inasmuch as we lower the temperature of the inflamed parts by covering them with linen wetted with cold water, or a cold evaporating lotion, we are doing what will have a beneficial effect in checking inflammation. One drachm of the liquor plumbi acetatis and a pint of water, with about two ounces of camphorated spirit, make a very good lotion for ordinary cases. In some instances, the liquor ammoniæ acetatis, diluted with water, to which a little camphorated spirit is added, may be employed; but whenever the surface is excoriated or ulcerated, the more simple the lotion is the better.

The great principle in view is *to keep up evaporation from the surface of the parts affected*, whereby their temperature will be reduced, and the inflammation checked; but in order to carry this principle fully into practice, we must wet the linen frequently, and not let it become dry, hard, and stiff, in which state it would have no effect as a means of carrying off the heat, and be more likely to do harm than good.

For the purpose of maintaining the operation of cold and moisture uninterruptedly, the French frequently have recourse to what is termed *irrigation*. A bucket, containing cold water, is slung to the top of the bed, and from a stop-cock the water falls in drops on the inflamed part, which is left uncovered. The water is collected in a sheet of oiled calico, and runs from it into another bucket placed near the patient's bed. A more convenient plan is that of placing the limb in a trough, and after some lint has been laid on the inflamed part, conducting the water to it from a basin by means of a strip of woolen cloth, one end of which is placed in the water, and the other cut into a pointed shape, put on the lint, as recommended by Dr. Macartney. Irrigation is more suitable for the hot months of summer than the winter season. In many cases, however, cold applications fail to afford relief, and *warm moist applications* prove more beneficial. Cold applications are useful on the principle of evaporation, by which the heat of the inflamed part is carried off; warmth any moisture may act by softening the inflamed tissues, and thus lessening tension. It seems to me, that this explanation may sometimes be correct; that it brings with it an appearance of probability, especially where the parts affected are near the surface. Be the theory, however, correct or not, the fact that *warm moist applications frequently answer better than cold ones* is perfectly ascertained. Numerous cases of inflamed breast or testicle are much more benefited by warm emollient poultices than cold lotions. I may also observe, that those inflammations which arise during fevers, and the generality of whitlows, boils, carbuncles, and inflammations about the anus, receive greater relief from warm moist applications than from cold lotions. The warm applications in common use are *poultices* and *fomentations*. One of the most convenient emollient poultices is that composed of linseed meal, made by first putting the requisite quantity of warm water in a basin, and then adding the linseed meal very gradually, at the same time that they are blended together with a spoon. We proceed in this manner until we have added as much linseed meal as makes the poultice of the desirable consistence. After the poultice has been spread on linen or tow, a little salad oil is sometimes put on it; but, if the poultice be changed at least twice a day, as ought always to be done, the oil may be dispensed with.

The size of the poultice must generally depend upon the extent of the inflammation, though there are cases in which the weight of a large thick poultice cannot be endured. Then lint, or linen wetted with tepid water, may be laid on the part, and covered with oiled silk to keep it from becoming dry.

Whenever we put a poultice upon an inflamed part, we ought to be sure to let it be so placed that it will not slip about, a condition in which it is not likely to afford any benefit.

In the most exquisitely tender kinds of inflammation, a poultice made of bread and water, bread and milk, or bread first steeped in warm water, and then medicated with the diluted liquor plumbi acetatis, or a watery solution of the extract of opium, or hyosciamus, will generally agree better than a linseed poultice. This is often exemplified where the parts affected are not only highly inflamed and full of nerves, but in an irritable, excoriated, or ulcerated state.

With regard to *fomentations*, they are frequently employed in the same cases as emollient poultices, the opportunities of applying them being the periods of changing the latter. A good fomenting liquor is made by boiling half a pound of camomile flowers or poppy heads for twenty minutes in a gallon and a half of water; the liquor may then be strained, and flannels or cloths wrung out of it, and put on the parts as warm as can be conveniently borne.

When the inflamed part can be conveniently immersed in the fomenting liquor or warm water, this is often the best way of fomenting it, that which is accomplished with the least disturbance of it. When inflammation is situated about the anus or perinæum, the patient may sit over a bidet filled with warm water, the steam of which will often afford great relief.

For inflammation about the abdomen, the neck of the bladder, and prostate gland, the slipper and hip baths are in common use.

With respect to the *choice of cold or warm applications*, there is one rule, which we may always safely follow when any doubt exists about the superiority of one plan to the other; viz., that of letting the patient's own feelings decide, for if he be rendered more easy and comfortable by one application than the other, we shall never do wrong in giving it the preference.

Another powerful means of checking and subduing inflammation is *counter-iritation*, which seems to be useful on the principle of exciting *an inflammatory action in the skin*, either in the vicinity of the inflamed part, or on some portion of the surface of the body with which the inflamed part is known to sympathise. Here one inflammation is established for the relief of another, and in proportion as the new is excited, the original and more dangerous inflammation declines. It is an illustration of what the old practitioners used to term *derivation* or *revulsion*, or the turning of the blood or fluids away from the part affected to some neighboring or distant part. However, we should be upon our guard against producing counter-irritation too near an inflamed part, more especially while the inflammation is in the acute stage, because, if a proper distance be not observed, the two inflammations are liable to conjoin, and render the disease worse instead of better. Thus, when the eye is inflamed, it is frequently more advantageous to blister the nape of the neck than the temple, where the anterior part of the blistered surface may approach too near the eyelids, and even make them inflame. The nape of the neck is sometimes preferred also on another principle, as being a part of the surface of the body, between which and the eyes a strong sympathy is known to prevail.

But the means, employed to excite counter-irritation, frequently operate at the same time on another principle. They do not merely produce an irritation of parts in the vicinity of those which are inflamed, or an irritation of parts at a distance from the latter, but connected with them by sympathy; they not only act in determining the blood away from the parts affected on this principle; but some of them, like blisters, bring about a great deal of their good effects by occasioning a copious discharge of serum from the vessels of the surface to which they are applied. After the cuticle has been removed, a discharge of pus may also be kept up from the surface of the cutis, if necessary, with savine ointment.

We should not be too hasty in having recourse to counter-irritation; for if we do so in the treatment of acute inflammation, without having first given the patient the benefit of bleeding and other means of depletion, the practice will rarely be of service.

There are other plans for accomplishing the same things which are aimed at with blisters; namely, the production of counter-irritation, and the maintenance of a discharge from the surface of the cutis, in order to relieve inflammation in another situation. Thus the formation of *issues* and *setons*, and the application of *antimonial ointment*, and the *moxa*, are often resorted to, especially where the inflammation is of a chronic character, or the most acute stage of it has been subdued by bleeding and other means. The antimonial ointment is composed of one drachm of tartate of antimony blended with an ounce of lard, and, when rubbed on the skin, it has the effect of bringing out pustules, and this sometimes, not merely on the part to which the friction is applied, but in other situations, and even on the genitals.

In inflammation, which is either originally chronic, or has become so, after the cessation of its acute stage, I believe counter-irritation, united with topical bleeding, is amongst the most efficient plans which can be adopted.

When inflammation is situated in a mucous membrane, and assumes a chronic form, attended with a morbid secretion, *counter-irritation* in the neighborhood of the original disease has frequently a most beneficial effect. Then also the application of cold astringent, or even stimulating lotions and ointments, to the surface from which the discharge comes, will often rectify the wrong action of the vessels, and bring them into a state in which they will be again qualified to produce only their healthy secretion. This fact is exemplified in gonorrhœa and purulent opthalmies.

Nitrate of silver has been of late used as an external application to the skin for the relief of inflammation. For this practical fact, built upon no hypothesis or theory, we are indebted to Mr. Higginbottom, of Nottingham. The method frequently succeeds in stopping inflammation of the fingers, which would otherwise suppurate and form whitlows; also in dispersing glandular inflammations, especially those brought on by scrofula in the glands of the neck, groin, or armpit. In University College Hospital, I have often adopted this plan very successfully, for promoting the dispersion of chronic buboes. It answers likewise sometimes for checking erysipelas and the inflammation of absorbents. Duly applied over and a little beyond the pustule of small-pox, nitrate of silver prevents the sloughing, which is the occasion of the pitting sometimes so disfiguring a consequence of this disease.

Sometimes blackening the skin with the nitrate of silver will not only prevent suppuration, but occasion the absorption of matter after it is formed and can be plainly felt. In some cases, it is enough merely to blacken the cuticle; in others, vesication must be produced. The part is first to be gently washed with soap and water, and dried, then moistened with cold water, and the nitrate of silver lightly passed over it once, twice, or thrice, in common cases; but oftener, if vesication be necessary. Afterwards the skin is to be exposed to the air and kept cool.

When inflammation is either originally chronic, or has become so after the subsidence of its acute stages, one principal indication is *to promote the absorption of effused fluids, the coagulating lymph and other deposits, by which the swelling of the parts is yet maintained, and the complete restoration of their functions prevented.* For this purpose, we may have recourse to friction with mercurial, champhorated, or iodine *liniments*, or to *lotions* containing a proportion of the muriate or acetate of ammonia, with vinegar and camphorated spirit.

For the fulfilment of the same indication, a *blister* is also sometimes the most efficient application, particularly where the synovial membranes are affected with chronic inflammation, as a consequence of the acute forms of it. In obstinate cases, a discharge should be kept up with savine ointment, or the blister be renewed from time to time.

In the treatment of chronic inflammation in general, we shall find counter-irritation, the occasional use of leeches, cold astringent applications, the external employment of nitrate of silver, friction with iodine liniments, and sometimes the exhibition of mercury or iodine internally, with purgatives, amongst the best and most efficient plans, the choice of which must depend upon the particular circumstances of each individual case.

The symptomatic fever, arising from inflammation, generally requires only those curative means, which are calculated to subdue the inflammation itself. It is chiefly in nervous irritable constitutions that its violence may be disproportionate to the extent, degree, or importance of the inflammation, and then such treatment as offers the best chance of tranquillising the nervous system, must be combined with antiphlogistic measures; but, bleeding is not to be adopted with unlimited freedom.

SUPPURATION AND ABSCESSES.

Suppuration is that process in the animal body, by which a fluid, termed *pus*, or the matter of wounds, ulcers, abscesses, and of all purulent discharges, is produced. It may occur in or upon any texture or surface that is furnished with blood-vessels, and consequently may take place in or upon any texture susceptible of inflammation, like which it is also so connected with an infinite number of diseases and accidental injuries, as to form a very important elementary subject in pathology. It is sometimes described as one of the terminations of inflammation; but this language is not strictly correct, inasmuch as suppuration may be, and frequently is, accompanied by a great deal of active inflammation. One should rather say, that it is attended with some modification of the inflammatory process—some change in the symptoms, than that the inflammation ceases.

Suppuration may be a consequence of *acute* or *chronic*, of *common phlegmonous*, or of *unhealthy* or *specific* inflammations, as those characterising carbuncle, malignant pustule, phlegmonous erysipelas, syphilis, scrofula, and numerous cutaneous diseases.

Suppuration, as brought on by acute inflammation, is illustrated in every common abscess following healthy phlegmonous inflammation, all the processes and effects of which are invariably quick, so that if resolution cannot be accomplished in four or five days, suppuration may be apprehended. Specimens of abscess from acute inflammation are seen in every common whitlow; in the generality of milk abscesses; and in every abscess following gun-shot wounds, bad compound fractures, and other mechanical injuries. Certain specific inflammations are likewise productive of suppuration in the acute form, as the venereal bubo, the first stage of purulent ophthalmia, gonorrhœa, &c.

Many specific inflammations lead, however, to suppuration in its chronic shape. The generality of abscesses from scrofula are chronic; and of this nature is the lumbar abscess. Exceptions to this statement, however, are not uncommon in abscesses formed round scrofulous joints; for, though after a time they generally become chronic, they often commence with every mark of acute inflammation.

The very gradual, quiet, and almost imperceptible manner in which some chronic abscesses take place, justifies the suspicion entertained by many, and especially by M. Andral, that suppuration sometimes occurs quite unconnectedly with any inflammatory process.

Suppuration may be induced by a variety of circumstances:—

1. By the intensity and violence of inflammation. 2. By the very nature and peculiarity of the inflammation, which, whether acute or chronic, naturally leads to the formation of a puriform fluid. This is mostly the case with whitlows, and always with purulent ophthalmia, carbuncles, boils, gonorrhœa, and the indolent inflammation preceding lumbar abscess. 3. By exposure of internal cavities and tissues, continued for a certain time; as is illustrated in every wound the sides of which have not been brought together, or which, after having been so brought together, have not united. Also in every case, where the surgeon lays open the tunica vaginalis, for the removal of a collection of blood within it, forming the disease termed *hæmatocele*. 4. Suppuration necessarily attends, or at all events follows, ulceration. The fact is exemplified in the origin and progress of every sore, whether of a healthy, unhealthy, or specific character. 5. Ulceration is not, however, essential to suppuration, which may be, and commonly is, brought on in mucous tissues by a very slight degree of inflammation, unaccompanied by ulceration, or any breach of surface. The much greater frequency of suppuration in mucous than serous tissues, is illustrated, not only in gonorrhœa and purulent ophthalmia, but in the bronchial membrane, the lining of the pelvis of the kidney, of the ureter, and bladder, of the frontal and maxillary sinuses, and ethmoid cells. 6. Suppuration, though not

frequent in parts lined by a serous membrane, is possible, as is proved in the disease termed empyema; the very case which first led to the discovery of the interesting pathological fact, that suppuration may happen without ulceration, or any dissolution or loss of the solids. It would seem, however, from modern investigations, that, when the surface of a serous membrane is about to suppurate, it first becomes covered with a layer of fibrine, in which many new vessels are developed, often preparatory to the formation of granulations. Dr. Macartney not only joins in this doctrine, but questions, whether, in any instance, the surfaces of the cellular, synovial, serous, and medullary membranes, the pia mater, or periosteum, can furnish genuine pus, *without the deposition and organisation of some coagulable lymph*. 7. Another frequent cause of suppuration is a considerable injury of textures by the application of great degrees of mechanical violence; as seen in contusions, compound fractures and dislocations, and in gun-shot and other wounds, attended with a great deal of contusion and laceration. 8. Foreign bodies, or extraneous substances, and irritating fluids lodged in the cellular tissue, are very frequently exciting causes of suppuration. Diseased or dead bone, or osseous fragments, quite detached, are to be viewed in the light of foreign bodies.

An *abscess* strictly signifies a collection of purulent matter in the substance or tissue of an organ, or part of the body. Frequently the matter of an abscess is contained in an orbicular cavity lined by a cyst; but sometimes it burrows into the adjacent textures, producing what are termed sinuses, or long narrow channels, which, if they open through the skin, or into a cavity lined by a mucous membrane, and continue without any disposition to heal, are termed *fistulæ*. When the pus is poured out from the surface of a wound, ulcer, or inflamed mucous membrane, and the matter does not collect in the tissue of the part, instead of saying there is an *abscess*, surgeons say there is a *discharge*, or simply *suppuration*. Sometimes, from there being no cyst, pus is *infiltrated* into the meshes of the cellular tissue, as the serum is in œdema or anasarca. This infiltration of pus is more commonly observed in the lungs than a circumscribed abscess. Very often pus is *diffused* over the surface upon which it is formed, as exemplified in peritonitis. "But, even in this case, the space containing the pus is sometimes circumscribed by adhesions of adjacent portions of the peritoneum; the pus may at length point externally, or make its way into the intestine or the vagina. In the first case, the abscess may be opened without the risk of exposing the general cavity of the peritoneum. This event (says Dr. M.'Hall) I have seen repeatedly after parturition and abortion."* A collection of purulent matter in the cavity of the pleura is termed *empyema*.

---

* Principles of Medicine, p. 12.

It is in the centre of the inflamed part that pus usually begins to be deposited, the texture seeming first to become in some manner or another softened, or, at all events, to be partially deprived of its power of cohesion. The formation of an abscess is often preceded by chills, or one or more fits of shivering, termed *rigor*. The probability of suppuration may often be foreseen by the violence of the inflammation, and the quickness of its course; and just before matter forms, the pain, throbbing, tension, swelling, and febrile disturbance (supposing the inflammation to be extensive or severe enough to excite fever) all undergo an increase. As external inflammation of the acute kind advances to suppuration, the skin becomes of a deeper red color, smooth, and glossy. A sense of throbbing and weight in the part continues after the matter is formed, and one portion of the swelling begins to rise or project beyond the rest of it, in a conical form, presenting a paler appearance, or even a light yellowish color, with a gloss and even a degree of transparency about it, permitting the purulent matter after a time to be plainly discerned. This conical projection which is termed the *pointing* of the abscess, is attended with a very thin state of the skin in the situation of it, and at length the matter arrives immediately beneath the cuticle, which breaks and permits the contents of the abscess to be discharged. The pointing and bursting of abscesses occur with more or less quickness, in proportion as the inflammation is more or less acute. A phlegmonous abscess will often point and burst in the course of a week, while a chronic one may not do so till several months, or even a longer period, have elapsed. In proportion as pus advances to the surface, the textures, intervening between the cavity of the abscess and the cuticle, are removed by absorption. In general, before an abscess points, a *fluctuation* may be felt in the swelling, one of the surest signs that it contains pus, inasmuch as a true fluctuation can only exist where fluid is present. In many instances, it is distinguishable even where the purulent matter lies at a considerable depth, covered by a great thickness of textures, and unaccompanied by any pointing of the abscess.

Dr. Macartney is satisfied, that the alleviation of the pain of an abscess after perfect suppuration has taken place, is not because the inflammation has terminated, but arises entirely from the change effected in the structure of the part, by which the tension is relieved, the walls of the cavity being rendered thinner by absorption, and thereby the pus better accommodated.

The knowledge of the right manner of examining a tumor suspected to contain matter, so as to have the best chance of distinguishing a fluctuation, is of the highest importance in practice; and here the skill does not consist in pressing each side of the swelling alternately, but in placing two or three fingers on one side of it, and while they are so applied, in tapping briskly on the opposite side with the fingers of the other hand.

The fluctuation will be more or less distinct in proportion to the thinness or thickness of the parts intervening between the abscess and the surface. The thickness or thinness of the pus, too, will materially affect the distinctness of the feel of fluid. When, in consequence of the thin state of the skin, there is a manifest tendency in the abscess to point, the fingers of one hand should be applied to this thinner part of the integuments, while another part is gently tapped with the fingers of the other hand. Thus, the fluctuation will assuredly be rendered perceptible; but the pointing alone, or even the inclination to it, is generally a sufficient indication of the nature of the swelling.

Great mistakes are continually occurring from inattention to the proper method of conducting the manual examination of tumors suspected to contain pus or other fluids; yet, it must be acknowledged, that some cases are attended with such obscurity as perplexes the most skilful. There is hardly any museum where specimens of medullary cancer are not to be found, into which a trocar or lancet had been introduced on the supposition of the tumors containing fluid. The softness and elasticity of that disease convey a sensation very like what arises from the presence of pus or a serous fluid. In order to avoid mistake, the mere manual examination of a tumor will not always be sufficient; the history of the case must be particularly investigated; every symptom minutely weighed; in what respect the disease resembles others; in what points it differs from them, should be well considered; and then the information, deduced from such reflections, should be joined with that derived from a skilful manual examination of the part. Thus a correct diagnosis may generally be formed.

Deeply-seated abscesses, and those formed beneath unyielding fibrous tissues, fasciæ, aponeuroses, &c. do not readily point. However, even under these circumstances, and when suppuration takes place still further from the surface, so that we cannot feel a fluctuation, we shall have reason to suspect what has happened, if, after a great deal of suffering and symptomatic fever, a kind of crisis should be manifested by an attack of shivering followed by a subsidence or a modification of the constitutional disturbance, and a sense of weight and coldness in the part, or of uneasiness and numbness, instead of the acute pain previously experienced. This suspicion will be corroborated, if the patient afterwards have nocturnal sweats, emaciation, a small quick pulse, and other hectic symptoms, not referable to any other cause. *Shiverings* or *rigors* more frequently precede deep-seated suppuration, than the formation of an abscess, near the surface. An œdematous swelling of the integuments over a deep abscess is another change affording light to the practitioner: and so, in particular examples, is the mechanical effect of the pressure of the matter, there being often an interruption of function from this cause, as must happen whenever the collected matter makes pressure on the brain, neck of the bladder, urethra, œsophagus, trachea, &c.

In many constitutions, especially those called scrofulous, a trivial increase in the action of the vessels may be followed by the formation of matter; and the appearance of an abscess is sometimes the first indication that such increased action must have existed, the patient having experienced but little, or even no previous uneasiness, or disturbance, in the part. These slow and indolent formations of matter are very different from others preceded by acute inflammation. The latter, just before they occur, are always attended with an aggravation of all the symptoms, both local and general, an augmentation of pain, excessive throbbing, heat, and tension, &c., all which effects, however, undergo a modification as soon as suppuration is completely established.

The *pointing of abscesses*, which arise from the approach of matter to the surface, must be preceded by a gradual absorption of the parts intervening between the matter and the skin. In this direction, then, the process is quite the reverse of that by which the boundary of the abscess is determined in other directions, where the adhesive inflammation has the effect of closing the cells of the cellular tissue, and consolidating the textures around the purulent fluid.

After the pus has made its way through the cutis, its discharge may for a time be prevented by thickness of the cuticle, which becomes separated from the cutis by the purulent matter under it. This detachment of the cuticle may proceed to a considerable extent; but, at length, the cuticle bursts, and then the matter escapes. The bursting of the abscess and the partial discharge of the matter, resulting from a spontaneous opening, give great relief, by diminishing the tension of the part, and removing the pressure of the pus. As the matter continues to be secreted, however, the discharge generally continues, and the opening itself may become larger than at first. If the case proceed favorably, the cavity of the abscess gradually diminishes; the adhesive inflammation and the granulating process ensue; and, as soon as the hollow is obliterated, suppuration ceases, and the opening, being no longer necessary for the evacuation of the pus, heals up.

If, however, from the nature of the disease, or the presence of dead or diseased bone, the lodgment of foreign bodies, or from the disturbance of the part caused by its situation or function, or from the difficulty with which the matter escapes, suppuration is kept up for some considerable time, the opening loses its disposition to close, and the passage, with which it communicates, assuming a chronic state, is termed a *fistula*, or *sinus*, though the term *sinus* is sometimes restricted to the passage, which the matter, when it cannot readily get to the surface, burrows for itself in the cellular tissue. We hear a great deal about *fistulæ in ano:* now the reason of their frequent occurrence here is owing partly to the disturbance of the disease by the action of the sphincter ani, and partly to the matter not having a direct and sufficiently ready outlet, and only partially escaping, at intervals, through a long, narrow, and often a tortuous course.

QUALITIES OF PUS.

The fluid, discharged from simple or phlegmonous abscesses, or from common wounds or ulcers which are in a healing state, is termed *healthy* or *good pus*, which is of a light yellowish color, often presenting a tinge of green in it, and being nearly of the same consistence as cream. Being heavier than water, it sinks in this fluid; but, if they are shaken up together, the water retains a turbid appearance. Examined with a microscope, pus is found to consist of opaque, light yellow globules, and a clear transparent albuminous fluid. The globules were believed by the late Dr. Pearson to consist of those of the blood, deprived of their natural color from some change effected in them by the process of suppuration itself, or that action by which they become separated from the circulation. Dr. T. Young's investigation tended to strengthen this doctrine, for he was led to the conclusion, that they really corresponded in size to those of the blood, and were all of the same dimensions, a character which the globules of milk and chyle are alleged not to possess. M. Gendrin believed them to be the globules of the blood, somewhat enlarged, and altered in shape; but, Dr. Hodgkin is of opinion, that they have no resemblance to the latter, inasmuch as they are irregular both in shape and size.* Yet, in noticing the slower motion of the blood as it approaches the dilated capillaries, and in discribing the beginning of suppuration, M. Gendrin states, that the globules of the blood gradually lose their color as they advance, and become globules of pus: and the blood thus changed seemed to him to exude very slowly in the form of pus. Healthy pus is a bland, opaque, inodorous fluid, without any acrid or corrosive properties. When pus is discharged, however, from various ill-conditioned sores, abscesses, or diseased surfaces, or from certain varieties of specific disease, or from parts where it is blended with urine or extravasated blood, or when it issues from a part where a portion of dead or carious bone is lodged, its smell is highly offensive, and its qualities acrid, irritating and even contagious. The presence of dead bone is often foretold by the peculiar smell of the discharge, with which is found to be blended a quantity of phosphate and muriate of lime. The matter of gonorrhœa has a smell unlike that of pus discharged from other diseases, and that of a cancer is so different, perhaps so much more disgusting, than the discharge from any other ulcer, that the presence of a patient with cancer is known to us as soon as we enter his ward. The fluid part of pus is coagulable by heat and the muriate of ammonia, a point in which it differs from the serum of the blood; also by alcohol and acids. Triturated with potash or soda, it forms a soapy fluid, and with ammonia a transparent jelly. When exposed to galvanism, it coagulates with rapidity, and yields a substance like albumen.

---

* According to Mr. Gulliver, the pus-globule is composed of central molecules, connected together by a substance which surrounds them, and is analogous to fibrin. The molecules themselves are found by him to differ from any part of the human blood-corpuscle in their form, density, indisposition to putrefaction, and complete insolubility in acetic acid.

Pus contains not only albumen, but fibrine, and it is partly upon these two facts, and its globular appearance, that is founded the inference of its derivation from the blood. In the transparent gelatinous fluid, poured out upon the surface of a wound or an inflamed serous membrane, no globules can at first be seen; but if the part be excluded from the air with a glass they begin to be perceptible in about a quarter of an hour.

The qualities of pus are diversified according to the nature of the disease that produces it. The matter of an irritable ulcer is thin, and adulterated with an admixture of blood, such kind of discharge being often termed *sanies* or *ichor*. Its peculiarity is, that it contains more salts and albumen in solution than ordinary pus, the clear part becoming turbid when an acid is added, by which the soda, holding the excess of albumen in solution, is neutralised. The matter of phlegmonous abscesses is not like that of a cancerous sore; and that of scrofulous abscesses is different again. In the latter, flakes of fibrine and albumen are blended with a limpid fluid, which contains a large proportion of soda and its muriate.

In some diseases of very different kinds, the mere appearance of pus is nearly the same. The matter of a phlegmonous abscess and that of a venereal bubo are not distinguishable from each other by their look, but only by the differences of their effects on the animal economy. The matter of gonorrhœa, that of the small pox pustule, and that of chicken pox, may present exactly the same appearance to the eye; yet, when applied to a mucous membrane, or the skin, the very different and peculiar effects, resulting from them, mark their extraordinary differences.

The former anxiety to discover a test between mucous and purulent secretions has in a great measure subsided. The old pathologists looked upon pus as a certain proof of ulceration, and consequently when it was expectorated, the lungs were presumed to be in an ulcerated state, and the patient's chance of recovery hopeless. It is now, however, perfectly well known, that pus may be formed by the cutaneous, mucous, and serous textures without any ulceration at all.

THEORY OF SUPPURATION.

This is a subject, on which different opinions are entertained by different pathologists; some regarding suppuration as a process similar to that of secretion; one, in which the formation of pus is brought about by a particular action of the capillary vessels; while others seem equally convinced, that pus is merely a transformation of coagulating lymph after it has quitted the vessels, together with some change in the color, and perhaps in the size and shape of the globules of the blood, either in their transit through the capillary system of the inflamed part, or subsequently to their extravasation. It is observed by M. Gendrin, that all textures are naturally pervaded by a very limpid fluid, which never coagulates spontaneously, though coagulable by alcohol, heat, or weak acids; and that consequently such fluid, which is of an albuminous quality, is not materially different from the serum of the blood. In the meshes of all inflamed textures a similar fluid is deposited; but as soon as the inflammation has attained a certain degree, there is deposited, in addition to the serous fluid, another fluid, which, on account of its fibrinous nature, has the property of coagulating spontaneously. If the inflammation be intense, this spontaneously coagulating substance is of a red color, or even blood itself; for, in the centre of the inflammation, there may be small clots of blood, and around them a gelatinous and liquid serum.

In a texture that has been for some time inflamed, and is now suppurating, the spontaneously coagulating fluid, fibrine, or lymph, is still noticed at the limits of the inflammation, and with the microscope the peculiar globules of pus may also be recognised in the interstices of the inflamed texture. At the points also, where the infiltration of lymph begins to assume a puriform appearance, true globules of pus may be seen, mixed with those of the blood, which have been only in part deprived of their coloring matter by stagnation, and still present a reddish grey hue.*

In acute abscesses, some of the small vessels seem, to Dr. Macartney, always to give way in the first instance, and blood and serum to be poured out into the surrounding tissue. "In order to separate the disorganised from the healthy structure, lymph is shed, by which the extravasation of blood and serum is restricted within certain limits. This lymph next acquires regularity and organisation, and then, *and not before*, the *secretion* of pus commences." (p. 30.)

The formation of pus would seem to be a consequence of some modification of the blood, as manifested by a change taking place in the color, transparency, and size of the globules, after its circulation has been arrested in the minute vessels by inflammation. It would seem also that this change usually takes place in the capillary vessels, and that these conduct the globules to the exterior, where they appear to be combined with the serum, under a peculiar liquid form called *pus*.

---

* Gendrin, "Hist. Anat. des Inflammations." "In the first steps towards the formation of an abscess, before the parts are made solid by coagulable lymph, blood is commonly extravasated."—*Macartney*, *op. cit.* p. 24.

This one mode in which pus is formed, a mode compared to the process of secretion; but, it is suspected, that pus may also be formed in the blood, under circumstances in which the influence of the capillary system, as exercising a function of secretion, can take no part. In plebitis, the conversion of blood into pus, independently of any action of the capillary vessels, is manifest. First, there is a cord-like hardness of the vessel; and then a softness of it, from the coagulated blood having become pus. Here the coagulated blood could not have passed into the circulation; and, as Professor Carswell notices, three remarkable circumstances are constantly observed. 1. Cessation of circulation; 2. Coagulation of the blood; 3. Conversion of the fibrine and globular part of the blood into pus. Inflammation is the common origin of these changes.

If, also, pus is sometimes met with simply as a foreign body in the blood, where inflammation can have had no share in its production, and in various parts, unaccompanied by the usual characters of inflammation, there can be no doubt of the propriety of adopting the distinction, suggested by Professor Carswell, between the *mere presence of pus* and *suppuration*. This view will lead us to regard the *production of pus* as not restricted to the effect of any process in the capillary vessels induced by inflammation, and to the subsequent separation of the elements of this fluid from the blood. As for *suppuration* itself, this may be essentially dependent on inflammation.*

The hypothesis of the transformation of coagulating lymph or fibrine into pus, independently of the action of the vessels, or of any vital influence of the inflamed parts, would not apply to many examples. By means of it, I think that it would be impossible to account for the great varieties observed in the qualities of pus in the different forms of inflammation, and especially for its specific properties in certain diseases. The vital influence of the vessels, their particular mode of action, must undoubtedly be concerned. It seems to me also, that any attempt to explain the formation of pus from mucous membranes, on this principle, would completely fail. The mucous secretion appears, indeed, to be readily changed into one of a purulent kind; no lymph is separately and primarily effused at all; and generally, in certain stages of the inflammation, the discharge is really a mixture of mucus and pus together.

Amongst the arguments, in support of the doctrine that pus is formed by an action of the vessels analogous to that of the process of secretion, the following merit particular consideration. Suppuration is influenced by many circumstances, which are well known to affect the secretions in general. An ulcer, while pouring out a white, thick, healthy matter happens to become suddenly irritated and inflamed; the discharge is immediately diminished, and degenerates into a scanty, thin, reddish ichor. This fact agrees with the effect of inflammation in lessening and otherwise altering the natural secretions of all organs, which happen to be the seat of it. Who does not know that the quantity and quality of the discharge from a wound, ulcer, or abcess, are often suddenly changed by mental emotion, by an attack of fever, by the state of the digestive functions, and by the diminution or increase of other secretions? Dr. Macartney has seen the influence of fever exemplified on the process of suppuration, in ulcers and in acute abscesses; and, "on one occasion," says he, "I knew the discharge of gonorrhœa to be entirely suppressed during the fever from measles, and afterwards to return when the fever abated." What experienced surgeon is unaware that the nature of purulent discharges is frequently changed by the influence of the nervous actions in the system, by some organic or functional disorder in other parts of the body, with which the suppurating parts have no direct connexion either of function or structure? Nor is this all the argument in favor of suppuration being a process analogous to that of secretion; for, whether one kind of pus is to be produced or another, often seems to depend upon the particular constitutions of individuals,—upon peculiarities in their whole organisation. Thus, in scorbutic patients, the discharge is always a thin, ichorous fluid, more or less blended with blood; in scrofulous subjects, liquid albumen, with clots of fibrine floating in it, and an admixture of soda and its muriate.

---

* See Carswell's "Elementary Forms of Disease," Fasciculus 5.

The formation of pus from the surface of the cutis, or a mucous membrane, free from ulceration, may be received as a satisfactory proof that pus may be produced without any dissolution of the solids. This fact attracted the notice of several eminent men about the middle of the last century, especially of Dr. W. Hunter, La Peyronie, De Haen, Quesnay, and Morgagni. In examining the chest of a person, who had died of empyema, or an accumulation of purulent fluid in the cavity of the pleura, Dr. Hunter observed, that every point of this serous membrane was entirely free from ulceration; and La Peyronie, on opening the head of a person who had had a long and profuse discharge of pus from the cavity of the skull previously to death, inferred, from the trivial porportion of brain wanting, in comparison with the immense quantity of matter which had been voided, that the pus must have been formed by the vessels, and not by any dissolution of the solids. But, although this doctrine prevails extensively at the present time, and seems to rest upon a good foundation, the question whether a partial dissolution of textures ever accompanies suppuration is another point. The microscopical researches of Kaltenbrunner tend to prove, not only that the blood, which passes into the inflamed texture, but also a portion of the solids, is converted into pus. We know, that just before purulent matter is formed in the substance of parts, there is a softening, a loosened state of their textures, more particularly in the situation where the pus is first produced, or about the centre of the inflammation. Perhaps a portion of the softened textures may sometimes be blended with the matter; but then it would only be an accidental addition, and not by any means a constant and essential occurrence in the process of suppuration. A few years ago, there was a girl in St. Bartholomew's Hospital for an abscess of the hip. An opening having been made, a mixture of well-formed pus and of an oily fluid was discharged, followed by a considerable lump of adipode substance. Here, no doubt, the fatty matter was only an accidental addition, and not mixed with the purulent matter, as an essential part of it. The matter, discharged from some abscesses of the liver, is remarked to have a brownish color, and hence the suspicion, that portions of that organ may be dissolved and blended with the pus; but whether this is the fact, or whether the matter may derive its peculiar color from the bile, are points not at present determined.

The following is Dr. Macartney's view of this part of the subject. "In some abscesses (he observes), as those of the liver, spleen, and brain, we sometimes see with the naked eye the lacerated vessels; and, in the first, I have observed the biliary vessels also to be broken, and the bile mixed with the blood, contained in the cavity of the abscess." (*Op. cit.* p. 24.)

Although there is no texture (if the cuticle, the nails, and the hair be excepted) which does not occasionally become inflamed, yet an *abscess*, strictly so named cannot form in every tissue. For instance, it cannot take place in the dense fabric of fibrous and cartilaginous textures, nor in that of serous membranes. When pus is formed by these tissues, it is effused either upon their surfaces or into the cavities which they invest; but an abscess never forms in their proper substance. On a serous membrane also, the formation of pus is preceded by an effusion of lymph, and, I believe, also by the development of vessels in it,—another consideration in support of the doctrine, that pus is not simply a transformation of such lymph itself, but a fluid, in the production of which the action of the vessels is concerned.

Pus has sometimes been found in the centre of clots of blood in the heart, or large vessels. In the museum of University College is a heart, the right ventricle of which contained a coagulum, within which pus was observed. According to Andral's account, such facts have been noticed, not only in cases where, before death, there had been suppuration going on in other parts of the body, but likewise in other instances where no such condition could be traced. The latter consideration has of course been adduced as an argument in favor of the doctrine, that a coagulum has the power of forming pus within itself. With reference to this part of the subject, it deserves attention, however, that where pus has presented itself simply as a foreign body in the blood, Professor Carswell has invariably found suppuration coexisting in some organ or texture; and, in the contrary cases, as referred by M. Andral, he suspects that the fluid was not pure pus. If such be the origin of some puriform deposits in the blood, they come under the head of *suppuration*, the pus having found its way into the blood from the part where the suppurative process is going on. In such cases, the pus is mostly found in the veins; arteries do not contain it, and, except in uterine phlebitis, Professor Carswell has never seen pus to any great extent in the lymphatics.*

Although suppuration is commonly preceded by inflammation, yet some collections of purulent matter are now and then met with in the dead subject, the existence of which was never denoted by any symptom of inflammation during life, while, in the dead body itself, there are no vestiges of inflammation around the purulent deposit. The color, consistence, and thickness of the textures are unchanged. The pus, as Andrel states, is interposed between their constituent particles, and this is all that can be discovered. On the other hand, Dr. Macartney concurs with those pathologists who believe, that some degree of inflammation is always coexistent with the process of suppuration.

The interior of an abscess appears to be both a secreting and an absorbing surface. Thus, when the pus has been discharged, the cavity soon becomes filled with purulent matter again; and sometimes abscesses, the matter of which is very palpable, completely subside and are dispersed. Purulent fluid is sometimes detected in the absorbent vessels in the vicinity of abscesses. The complete dispersion of buboes, by absorption, after the formation of matter in them, is a frequent occurrence; and the same fact is often exemplified in chronic abscesses. Dr. Macartney has known this happen several times in psoas abscess unattended with disease of the vertebræ (p. 33.); and a similar result I have also sometimes witnessed. Such facts can only be accounted for on the principle of the lining of an abscess being both a secreting and an absorbing surface. When, indeed, the abscess has existed some time, the matter is contained in what deserves, on every account, to be called a cyst, the consistence and texture of which give it very much the character of a mucous membrane. Fistulæ and sinuses are invested by a similar structure.

Purulent matter, formed in the textures of the body, generally has a tendency to make its way to the surface, and to be ultimately discharged in this direction. John Hunter regarded this as an established principle in the animal economy, the usefulness of which in promoting the cure of many diseases is sufficiently manifest. Abscesses will make their way through a considerable thickness of parts to reach the skin, and this even when merely a delicate serous membrane intervenes between the purulent matter and the cavity of the chest or belly. In fact, such membrane, instead of giving way under these circumstances, usually becomes thickened and strengthened.

---

* See Carswell's "Elementary Forms of Disease," Fasciculus 5.

There is one peculiarity in the course taken by pus, which may at first seem rather at variance with the principle that abscesses have a tendency to make their way to the surface: I allude to a certain disposition in some abscesses to burst into any neighboring cavity, or duct, lined by a mucous membrane. Thus abscesses near the urethra frequently pass into that canal; abscesses near the rectum commonly discharge themselves into that intestine; and abscesses of the liver frequently burst into the duodenum or colon. In these instances, I think, we may discern the same kind of reason for the direction which the matter takes, when so situated, as is plainly manifested when the pus passes towards the external surface of the body; namely, the pus, by passing into a contiguous canal, passage, or bowel, lined by a mucous membrane, is often taking in reality the most direct course to find an outlet from the system.

Nothing forms a greater impediment to the passage of matter towards the skin, than the interposition of a dense fascia. Then the pus is apt to spread extensively under the fascia and between the muscles, causing sinuses, and an extent of mischief seriously interfering with a prompt cure.

TREATMENT OF ABSCESSES.

In every instance of abscess, attended with acute inflammation, one plain indication presents itself, viz. that of lessening the inflammation which has given rise to the formation of matter, and which is still going on in the surrounding parts. Suppuration is not a termination of inflammation, but only a modification of it; a change, in which the increased action of the vessels is altered, not stopped. Indeed, that the parts around the abscess are often severely inflamed, is a fact completely manifest to the eye. Whether the swelling has suppurated or not, inflammation is still present; its degree may differ in different cases; but the reality of its existence must not be overlooked in practice. A different view, however, must be taken of an abscess which has existed some time, which has perhaps been burst for several days, and which may be said to have lost its acute character. In stating, then, that the tissues immediately around an abscess are more or less inflamed, I am particularly referring to the early stages of suppuration, as a consequence of acute or phlegmonous inflammation.

After matter has been formed, it may not always indeed be necessary to have recourse to measures which will seriously reduce the strength of the system; it may not always be right to bleed the patient again in the arm, or to restrict him to quite so low a diet as that to which he may previously have been confined; yet other general means, calculated to check inflammation, and in particular mild saline purgatives, and abstinence from all external and internal stimuli, and from every thing likely to quicken the circulation, or to disturb the mind or body, or the suppurating part itself, must still be proper. Also, while the parts around the abscess continue painful, red, tense, and hot, and the patient is not too much reduced, the application, and even the repetition of leeches will be beneficial.

When no chance remains of acute inflammation ending in resolution, it is a common and good rule to discontinue cold applications, and substitute warm ones. These last will materially soothe the pain, abate the violence of the inflammation, and accelerate the arrival of that stage, in which the matter will either make its way out, or be in a fit state to be discharged. Such applications, together with leeches, mild apperient medicines, a lowish diet, opium, if the suffering be great, and keeping the part at rest, will constitute the most useful practice. By conducting the treatment of the early stage of phlegmonous or other acute abscesses on the principles of a moderate antiphlogistic plan, matter already deposited may sometimes be dispersed, when, without such practice, no chance of this success would exist.

Another general indication is to remove all sources of irritation,—every thing that is exciting or keeping up the inflammation and suppuration. Thus, when abscesses in the perinæum, or about the neck of the bladder, originate from the effects of a stricture in the urethra, or when an abscess it produced by the irritation of a foreign body—the presence of dead bone, &c., the removal of the exciting cause is an essential part of the surgeon's duty.

When an abscess is completely formed, and the accumulation of matter in the part is denoted by the fluctuation, pointing, and other circumstances already explained, it is a common rule in surgery to free the part without delay from the matter collected in it. After purulent matter has been formed, and become confined in the part, its very pressure is a cause of severe pain, if not of an aggravation of the inflammation itself. I can conceive, that the discharge of the contents of the abscess not only alleviates pain by removing pressure and tension, but is also importantly useful in putting an end to these causes of inflammation. If an abscess be small, and making quick progress to the surface, with pointing, and a thin state of the skin, denoting that it will soon burst, whether a puncture be made or not, is a consideration of little importance; for here no risk prevails of the patient's suffering being long protracted, or of the matter accumulating or spreading to any extent. It is not often that abscesses from acute inflammation are dispersed; they generally come forward, and every attempt to prevent it, for the most part, only retards the cure. Perhaps we might have prevented matter from forming at all by suitable treatment in the earlier stage of inflammation; but, the abscess being already formed, its absorption is what cannot usually be expected. However, certain abscesses, rapidly formed in a very reduced state of the constitution, and without much inflammation, generally have a greater tendency than others to be dispersed, because, under these circumstances, the whole absorbent system is actively at work; and then, if the kidneys, the mucous membrane of the bronchial tubes, or the bowels, or the vessels of the skin, be excited to augment their respective secretions, the pus collected in some other part, and especially that collected in or about absorbent glands, will sometimes be dispersed. When patients are using mercury, kept perfectly quiet, and the integuments touched with the nitrate of silver, buboes, containing an ounce or two of matter, occasionally subside. Perhaps these last cases furnish the most frequent instances of the fact under consideration. The remains of large lumbar abscesses are also sometimes dispersed by absorption; and the effect of the nitrate of silver on whitlows and on scrofulous abscesses about the neck, is also an exemplification of the possibility of bringing about the removal of pus by the action of the absorbents.

All surgeons agree about the propriety of opening abscesses under the following circumstances, as soon as a fluctuation can be felt, or even sooner, if there be other symptoms leaving no doubt of matter being formed and confined.

1. Abscesses arising from the extravasation of stimulating fluids in the cellular tissue, as urine or fecal matter.

2. Abscesses from acute inflammation, situated in parts abounding in fat and loose cellular tissue, where sinuses are apt to follow the confinement of the pus. Examples: abscesses about the anus and rectum, groin, or armpit.

3. Abscesses under fibrous expansions, dense unyielding fasciæ, or within the sheaths of tendons. Examples; abscesses under the fascia of the thigh, leg, or fore-arm, or under the palmer or plantar fascia; deepseated whitlows.

4. Abscesses from diseased or dead bone, or within the medullary texture or natural cavities of bones. Examples: suppuration within the antrum, diploe of the skull, or abscesses from necrosis.

5. Abscesses, attended with any risk of the matter making its way into the chest or the abdomen.

6. Abscesses under the sterno-cleido mastoid muscle, in the cellular tissue separating this muscle from the deeper parts.

7. Abscesses, whose contents produce urgent and dangerous functional disturbance by the pressure on important organs, as illustrated in abscesses near the urethra, neck of the bladder, or near the trachea, larynx, œsophagus, or about the fauces, or on the duramater. At the request of Dr. Campbell, I visited a child in Welbeck Street, on the point of suffocation from the pressure of an abscess on the trachea, which had formed with great rapidity

around the thyroid gland. The discharge of the pus afforded prompt relief.

8. Abscesses, where the matter lies close to a bone, should be opened without delay. Periostitis with suppuration is a case requiring such practice; also abscesses under the occipito-frontalis muscle.

9. The generality of chronic abscesses should be opened early, because a long while elapses before they burst of themselves, and, in the mean time, they continue to increase, and at length frequently become formidable on account of their magnitude.

Abscesses are commonly opened with a cutting instrument, which is generally preferable to caustic, as letting out the matter more expeditiously, and with less pain, occasioning no loss of substance, and consequently a smaller cicatrix, and forming the outlet of the pus in the most advantageous direction, and of the exact size required. Caustic is now and then employed, however, for opening buboes or abscesses in the groin, in order to make a larger and more permanent opening, than a mere puncture, and to destroy a portion of the diseased skin. By this means, it is conceived that the formation of sinuses is more likely to be hindered, the healing of the cavity from the bottom ensured, and an undermined state of the integuments prevented. Generally speaking, caustic is not an eligible means of opening abscesses; for its action is tedious, painful, productive of loss of substance, and disfigurement, and capable of being regulated with any precision, so that after all a cutting instrument must sometimes be used. A seton is now and then introduced through a chronic abscess, either where the surgeon wishes the matter to escape gradually, or to excite a degree of irritation in the cavity, so as to make it granulate.

When only a small puncture is needed, a common lancet, or a sharp pointed narrow straight bistoury, answers very well. When a larger opening is necessary, an abscess lancet, a double-edged bistoury, or any sharp-pointed scalpel, may be employed. By moving the edge of one of these instruments forward after the part has been punctured, the opening may be made of an advantageous size, with the greatest facillity and quickness. In opening abscesses, situated near important organs, the surgeon may make the requisite enlargement of the first opening with a curved bistoury, guided on a director.

The best place for the puncture is generally where the fluctuation is most perceptible, or where the pointing takes place; for, here the skin is thinnest: this consideration, however, is not to make us unmindful of the advantages of a depending opening, which lets the matter readily escape, and often removes all occasion either for the enlargement of the first opening, or for the formation of a second in another place. This latter, which is termed a *counter opening*, becomes necessary when an abscess bursts at a point from which the matter cannot escape with sufficient readiness.

The size of the opening should be such as will allow the matter to escape with facility. When the matter is thick, or contains flakes of coagulated albumen, the opening should be a free one, to enable them and the pus to pass through it.

Another maxim is to maintain the opening until the cavity of the abscess is so far reduced, that another accumulation of matter is not likely to occur from the spontaneous closure of the outlet. There is sometimes an exception to this rule, with respect to large chronic abscesses, where Abernethy thought it safer, after discharging the matter, to heal the puncture at once, and afterwards repeat it when the matter had collected again. In this way, he conceived, that inflammation of the cyst of the abscess, and severe constitutional disturbance, were most likely to be avoided.

Sinuses are produced by the matter not readily getting to the surface, or not having an outlet made for it with due promptitude. Here the principal indication is to make an opening in such a situation and of such a size as will prevent all further lodgment of pus; for this purpose, the first opening may be enlarged, or sometimes a counter-opening made.

Fistulæ are disposed to occur whenever there is something at the bottom of, or in the position of the abscess, keeping up suppuration a long while, or preventing the ready escape of the matter that forms; also where the abscess is subject to continual disturbance from the action of muscles; hence one cause of *fistulæ in ano.* Fistulæ arise also from the passage of the contents of certain bowels or receptacles through the abscess, or from its having a communication with some excretory tube: hence lachrymal, salivary, and perinæal fistulæ.

In the treatment of fistulæ, the indications are to make a freer and more direct opening; to remove whatever is keeping up suppuration; to destroy any stricture or obstruction of an excretory tube, causing the urine or other fluid to pass through the fistula: and, in fistulæ in ano, to divide the sphincter, the action of which being then temporarily stopped, no longer disturbs the part and impedes the cure.

In the treatment of abscesses attended with fistulæ and sinuses, or a backwardness to heal from the pus not passing out readily a position calculated to facilitate the escape of the matter from the opening, or the skillful application of a compress and bandage over the place where the matter collects, frequently supersedes all occasion for fresh incisions.

When fistulæ and sinuses cannot be cured by attention to the foregoing principles, and they have become perfectly indolent, their course should be traced with a probe or director, and laid open with a curved bistoury. Now and then, instead of this method, a seton, or a stimulating injection is tried, but these measures are attended with uncertainty, and by no means in favor with the most judicious surgeons.

The old painful plan of squeezing out every drop of pus from an abscess that has been opened, and the practice of distending the cavity with lint, are now exploded. In fistulæ in ano, which have been divided, a piece of soft lint may be gently interposed between the sides of the wound, directly after the operation, in order to prevent the superficial part of the incision from healing sooner than the deeper part of it, the result of which might be, another confinement of matter, and a return of the fistula.

As a general rule, all acute abscesses require poultices and fomentations, not only during their formation, but for some time longer, that is, until they have burst or been opened, the swelling and surrounding inflammation have abated, and the discharge has been considerably reduced. Such applications are then to be discontinued, and common dressings and a bandage applied. In proportion as the inflammatory action subsides, the patient's diet is to be improved: and, if the discharge continue in large quantities, or repeated abscesses form, either from some mechanical injury, or structural or organic disease, it will be necessary to support the patient's strength, because a *hectic* state now comes on, one prominent feature of which is debility.

HECTIC FEVER.

Hectic Fever is essentially characterised by a frequent weak pulse, flushings in the face, the hands, or the feet, and either profuse night sweats, or diarrhœa. The irritation of a local injury upon a healthy constitution produces that disordered state of it, termed the *symptomatic*, or *sympathetic inflammatory* fever. This is the *immediate* consequence of local irritation. The system, fatigued and debilitated by the continuance of a disease which it cannot subdue, at length loses the power of entering into those strong actions, which characterise the preceding description of fever. However, exhausted as it is, it still sympathises with the local irritation. The exciting cause is almost always some local disease, and generally a great if not an incurable one; so that this fever seems to be a feeble and hopeless struggle of a constitution about to be overpowered, without any apparent tendency to the removal of the cause. *Hectic* fever, contrasted with the sympathetic inflammatory fever, is to be regarded as the *remote* consequence of local injury or disease.

The constitutional symptoms, which attend the formation of pus in long-continued profuse suppurations, or which arise as effects of many obstinate and incurable local diseases, even without any suppuration, are generally comprehended under the name of hectic fever. However, some writers still believe, that hectic fever is in every instance connected, if not with the absorption, at least, with the formation of pus.* My own observations do not allow me to entertain such an opinion. How commonly do we see patients suffering considerably from hectic symptoms in cases of white swelling, diseased hip-joints, tuberculated lungs, and curvature of the spine, long before any suppuration has taken place? I should say, that the long-continued irritation of any severe local disease upon the constitution, whether accompanied with suppuration, or not, generally produces hectic symptoms. Dr. T. Young informs us, that, when he was fifteen years of age, he had himself severe hectic, and every other symptom, usually attending the formation of pulmonary tubercles, though they never arrived at the period of suppuration. And, in another place, he correctly remarks, there are cases in which a particular change in the state of the fluids, secreted by diseased parts, seems to bring on hectic symptoms, as when an abscess is opened, and the pus is exposed to the air. But, says he, this state of the fluids is not the only cause of hectic, for it often occurs. not only without an open abscess, but *without any abscess at all.* And, on the other hand, in cancerous cases, where there is a very unhealthy suppuration, with great pain, there is often no material hectic to the last.† It is true, at the same time, that hectic fever is most commonly preceded by suppuration; but the only reason of the fact probably is, that the greater number of local diseases, which come under the care of the surgeon, are in their advanced stages accompanied with ulceration or abscesses. We see that certain local diseases, which cannot be called severe, though they secrete for a long time a great deal of purulent matter, do not bring on hectic symptoms. We may keep open an issue for a year, or the urethra may discharge a good deal of pus daily for an immense length of time in tedious cases of gonorrhœa, and yet hectic fever does not arise. Suppuration alone, unless exceedingly profuse, in which circumstance it must always be the effect of a severe form of local disease, is not to be regarded as the essential cause of hectic.

Neither does the hypothesis, which ascribes the cause of this fever to the absorption of pus, appear to have a better foundation. The inside of every abscess is both a secreting and an absorbing surface, and, by the combined action of the arteries and lymphatics, the matter is incessantly undergoing changes. If then the absorption of pus were a cause of hectic symptoms, they would accompany every abscess, without exception. Yet experience teaches us, that this is far from being the case: and that abscesses continue for a very long time without the patient becoming hectic. Nay, we observe, that pus, even if the worst quality, may be absorbed without producing a single hectic symptom; for we daily see the matter of phlegmonous abscesses, scrofulous suppurations, and venereal buboes, manifestly and entirely removed by the absorbents, and yet no hectic symptoms are the consequence.

---

* Thompson on Inflammation, p. 326.

† A Practical and Historical Treatise on Consumptive Diseases, 8 vo. 1815, p. 6. 10. 53.

Hectic fever comes on at very different periods after the commencement of any serious local disease. This is probably owing to peculiarities of constitution, as the particular structure and functions of the part, whose disease operates as a cause. The more delicate and feeble the patient natarally is, and the more severe and incurable the local disease, the sooner do the hectic symptoms generally begin, and the more rapid is their progress. Disease of the lungs will bring on hectic fever sooner than disease of a joint.

Sometimes the first accession of this fever are almost imperceptible; a slight degree of emaciation, pulse a little quicker than ordinary, with a trivial increase of heat, particularly after meals, being the only early symptoms. As the fever becomes more established, the symptoms are generally of the following kind: a frequent small pulse, which quickens towards evening, but is always ten or twenty strokes in a minute faster than in health; a moist skin; pale copious urine, with sediment; a good deal of debility; the tongue seldom so much furred as in most other fevers, its edges being of a bright red color, and the papillæ swollen and prominent; a florid, circumscribed suffusion of the cheeks; loss of appetite; sometimes an ejection of all food from the stomach; a great readiness to be thrown into sweats; profuse nocturnal perspirations; frequently a constitutional purging; repeated chills and flushes of heat; derangement of the nervous system; loss of sleep; indigestion; heartburn; flatulence. When, however, the biliary system is undisturbed, the digestive powers are little impaired, and the appetite remains good to the last. In an advanced stage, the hair falls off, and the nails become bent.

Hectic fever is more or less remittent, but never wholly intermittent. The pulse is generally from 100 to 140 in a minute; seldom falling below 100, even in the time of a remission, and, in some cases, never being under 120: while, in other constitutions, the pulse of health may be so slow that ninety strokes in a minute would be enough to indicate an exacerbation.

The principal exacerbations generally occur about five in the afternoon; and, an increase of the febrile symptoms always follows a full meal at any time of the day. The exacerbations, which are mostly preceded by chills, are marked by a sensation of burning heat in the palms of the hands, which become red and mottled, and frequently in the soles of the feet. A circumscribed redness is seen in the cheeks, the color of which, in persons of a florid and delicate complexion, has also, during the remission, a more abrupt termination than in health. Whatever may be the form of the exacerbations in the daytime, they are generally succeeded towards the end of the night by copious sweats. When a diarrhœa supervenes in the latter stages of the disease, the sweats commonly disappear. A redish sediment uric acid is mostly observable in the urine after the sweats; but it is absent during the hot fit, when the urine is usually pale and limpid.

Hectic fever is divided into two kinds; viz. one, which arises from the absolute incurability of the local complaint; another, which depends upon a disease that is curable, if the patient's constitution had powers sufficient.*

TREATMENT OF HECTIC FEVER.

The exciting cause of every disease must be removed, ere a perfect cure can be expected. If copious and long-continued suppuration give rise to that affection of the constitution denominated hectic fever, how can the febrile disturbance cease while the discharge of matter continues? If the irritation of a scrofulous joint were to excite hectic fever, we should in vain except to put an end to the constitutional disorder, unless the local cause were first removed. In short, as Dr. T. Young observes, the radical cure of symptomatic hectic fever can only be attempted by remedies calculated to remove the primary disease, on which it is dependent.

When the local complaint, connected with the fever, is totally incurable, the diseased part must, if possible, be removed by a manual operation. But when the local disease presents the prospect of being cured, provided the state of the constitution were improved, the surgeon is to endeavor to accomplish the latter object. Frequently, however, the nicest judgment is requisite to determine, how long it is safe to exert the power of medical surgery against the influence of an obstinate local disease on the constitution; for, although patients in an abject state of weakness, arising from irremediable local disease, have often been restored to health by the removal of the morbid part, yet many have been suffered to sink so low that no future treatment could save them.

When an incurable disease in an extremity is removed by amputation, the hectic fever immediately begins to abate. "I have known," says John Hunter, "a hectic pulse at 120 sink to 90 in a few hours, upon the removal of the hectic cause; I have known persons sleep soundly the first night, without an opiate, who had not slept tolerably for weeks before; I have known cold sweats stop immediately, as well as those called colliquative; I have known a purging stop immediately upon the removal of the hectic cause, and the urine drop its sediment."

---

* See Hunter's Treatise on the Blood, inflammation, &c., p. 497.

But, though the radical cure of hectic can never be effected, unless the primary disease be cured or removed, the severity of this fever may often be palliated, and its progress retarded, by appropriate remedies. As weakness is one of the principal features of hectic fever, blood-letting is never admissible; except, perhaps, in a very few examples, where the disorder is attended with unequivocal marks of inflammation in some vital organ. For the same reason, purging must be avoided.

I am afraid no medicine has the direct power of communicating strength to the human constitution; and it is more than probable that bark itself and quinine only prove serviceable in hectic fever, by sometimes improving the tone of the digestive organs. While the patient eats and digests well, I believe, they are never of any service.

Bark was a medicine that filled the old practitioners with a blind sort of confidence in the worst of cases. They saw dreadful forms of disease, accompanied with hectic symptoms, sometimes get well while their patients were taking bark; but they forgot the vis medicatrix naturæ, whose efficacy often conferred an undeserved reputation on this, as well as on many other articles of the materia medica. When first I entered the profession, it was the fasihon to prescribe bark to a very great extent; patients were sometimes literally cramed with it; they were frequently purged, sickened, and weakened by it, instead of being strengthened. Nature, however, occasionally overcame both the disease and the supposed remedy; and the ruling prejudices were confirmed. The best surgeons of the present day use bark much less frequently and copiously than their predecessors. They sometimes give it in hectic fever, with the view of improving the appetite, but never on the supposition that it can directly strengthen the patient in proportion to the quantity taken into the stomach. The infusion or decoction, and the sulphate of quinine, are the most eligible preparations. When the hectic symptoms have somewhat abated, and general debility remains, steel medicines frequently prove the best tonics.

The patient is much more likely to be strengthened by nourishing food easy of digestion, than by bark, and it should be taken frequently, and in small quantities at a time. Residing in a pure, salubrious air, is also a matter of great importance. In these cases, wine, gentle cordials, and aromatic draughts, are useful; and opium is a valuable medicine, not only for procuring sleep and alleviating pain, but, when joined with ipecacuanha, for checking the diarrhœa which is so frequently present.

Digitalis has been praised for its beneficial effects in hectic fever; but Dr. John Thomson, who tried it, did not find this commendation well founded. The frequency of the pulse, says Dr. Young, may, indeed, often be reduced by it from 120 to 50 strokes in a minute; but it is extremely uncertain in its operation, and frequently violent and unmanageable in its effects: nor is it either immediately or ultimately beneficial in simple hectic affections. For checking the nocturnal sweats, diluted sulphuric acid is generally considered the best remedy, when the bowels will bear it.

When local disease is curable, if the constitution could bear it long enough, or the health were improved, medicine may be availing; but the utmost, which can be expected from it in all other instances, is a temporary palliation of the symptoms. These, however, will recur, and in the end prove fatal, unless the diseased part, the cause of the febrile disorder, admit of removal by a surgical operation.

◆

MORTIFICATION.

1 .By the term *mortification* is signified *the death of a part of the body*, frequently of a considerable part of it, or the conversion of such part into a dark-colored black, fetid, cold insensible mass, with which the general nervous and vascular systems no longer have any organic connexion. In the bones, the state, corresponding to mortification of the soft parts, is called *necrosis*.

Dr. Carswell justly observes, that as the descriptive characters of mortification were originally drawn from the appearances which it presents in external parts of the body, they are also employed by the pathologist, as the means of enabling him to detect it in internal organs after death. "It may, however, be fairly questioned," he says, "whether the application of the term mortification has not been too restricted; and whether parts, deprived of their vitality and separated from the living tissues, should not be designated by the same appellation as those which, similarly situated, differ from them only in point of color and, perhaps, smell. Softening of the cerebral substance, of the mucous, and frequently of the serous membranes, constitutes a state of positive death;" though the softened substance, in these instances, presents neither the peculiar color, nor the color of external mortified parts.*

The entire and permanent cessation of every action and function in the part is absolutely essential to what is understood by *mortification*; for sensibility and power of motion may be annihilated, and yet the part affected may continue to live, as is familiarly illustrated in paralysis. The temperature of a palsied limb is generally diminished, and so probably is the momentum of the blood in it; still, the fluids pursue their usual course in it, nutrition and absorption are carried on, and the parts retain for an indefinite period what may be considered as an inferior degree of vitality.

---

* See Carswell's "Elementary Forms of Disease," Fasciculus 7.

We know that it is the property of living matter to resist putrefaction; but no sooner is life withdrawn from any of the animal textures, than they become subject to the action of chemical affinities; they are decomposed, new combinations are formed, and various fluids and different kinds of gas involved. Hence putrefaction, and the disagreeable smell of parts in the state of mortification. Heat, sensibility, motion, and arterial pulsation, may be abolished in parts for several days, but afterwards gradually return. We see this fact exemplified in the effects of cold, and in the epidemic cholera, where from the interruption of circulation and secretion, and from the loss of temperature in parts, one might expect that mortification would be common, yet it is exceedingly rare. Thus, in three hundred cases of cholera, under Magendia, in the Hôtel Dieu, there was but a single example of mortification, and, in that solitary case, portions of the fingers were in the state resembling the form of mortification, which will be presently described under the name of *gangræna senelis.* In another hospital at Paris, that of St. Louis, only one instance of mortification presented itself amongst the numerous cholera patients, the extremity of the nose being attacked. Generally, however, in cholera patients, if they recover, cold, insensible, and destitute of arterial pulsation as some parts of the system may have been, such state does not bring on mortification, and consequently it is as different from true mortification as suspended animation is from real death. An erroneous judgment may generally be avoided by observing, that, when the part is not truly mortified, the cuticle is not detached from the cutis, and no fetid gas is involved.

It is correctly observed by Professor Carswell, that mortification is much more frequently observed in those organs in which the vascular system predominates, or in which an inordinate accumulation of blood is readily produced, on account of their greater sensibility, and their direct exposure to the influence of the causes of inflammation. Hence its greater frequency in the skin and cellular tissue, mucous membranes, and lungs, than in other textures; and hence its comparative rarity in serous and fibrous textures. The latter, indeed, are stated never to be found mortified, unless the cellular tissue from whose vessels they derived their nutrition has previously been diseased. In all the deeper forms of mortification, the cellular tissue is destroyed to a much greater extent than the skin and muscles; a fact to be remembered in judging of questions concerning amputation, and especially in deciding about the part of the limb to which the knife should be applied.

The most common form of mortification, namely, that which is called *humid*, on account of the abundance of moisture noticed in the dead parts, has two stages. To the early stage, while some marks of vitality yet remain in the disordered textures, the term *gangrene* is particularly applied.

Gangrene, then, is the condition of parts where mortification is not actually formed, but forming; it is the intermediate stage between the height of inflammation and the complete death of the parts. The latter event receives the technical name of *sphacelus*, in which state the parts are of a dark brown or black color, always devoid of circulation, sensibility, and natural heat, forming what are called in the language of surgery, *sloughs*. The best pathologists consider the state of parts, denoted by the term *gangrene*, as not absolutely incapable of recovery, the blood sometimes resuming its wonted course again, the natural temperature returning, and the healthy characters and functions of the part being restored.

Proper as it may be to have the distinctions of *gangrene* and *sphacelus*, the two terms are often used synonymously.

Mortification, when considered generally, and in relation to the causes by which it is produced, or the morbid conditions of the part in which it occurs, admits of the arrangement of its several kinds under three heads, as suggested by Dr. Carswell.

1. Mortification from cessation of the circulation.
2. Mortification from the violent operation of mechanical, chemical, and physical agents.
3. Mortification from the delerious influence of certain poisons.

Cessation of the circulation in a part may be produced, 1st, by inflammation; 2dly, by mechanical causes, which obstruct the passage of the blood; 3dly, by local or general debility.*

That inflammation brings on mortification by occasioning a stoppage of the circulation in the part affected, is a fact now well ascertained. Mortification is not, however, a frequent effect of common or phlegmonous inflammation in a sound constitution, except when the exciting causes are unusually severe, or protracted in their operation. Thus, in severe burns, bad gun-shot injuries, violently contused and lacerated wounds, compound and comminuted fractures, and other injuries produced by great degrees of mechanical violence, or by means acting chemically on the body, a portion of the hurt parts is frequently destroyed at once, and must be thrown off in the form of a slough; while other parts of them, not actually killed, are yet so injured that they are seized with violent inflammation, which quickly terminates in gangrene and spacelus. In some other instances, the inflammation ends in mortification on another principle, namely, because the action of the exciting cause is protracted beyond a certain time, as when urine is effused in the cellular tissue, and suffered to remain in it too long; or when a portion of intestine in a hernia continues beyond a certain period in a state of strangulation.

---

* See Carswell's "Elementary Forms of Disease," Fasciculus 7.

When mortification follows an external injury, as a bad compound fracture, or a severe and extensive laceration of the soft parts, it is invariably preceded by redness, swelling, and other marks of inflammation; the cuticle is raised in the shape of vesications, containing a dark bloody serum; the texture of the skin is softened, and assumes, first a dark purplish, greenish, or livid hue, and then a blackish color; the cellular tissue is destroyed; putrefactive changes commence; air is generated in the disordered parts, so as to give rise to an emphysema of them, a crepitation being perceived on touching them; the exhalations from them are exceedingly fetid, and, about the textures destroyed, there is generally more or less humidity;—hence the term *humid gangrene*, by which this form of mortification is distinguished from another, characterised by the disorganised parts being nearly destitute of moisture, and therefore called *dry gangrene*.*

Humid mortification is sometimes named *acute*, as contrasted with other varieties of it, which originate with little or no preceding inflammation, not from *external violence*, but from *internal causes*; and, being slow in their progress, are called *chronic*.

When the *humid* species of mortification follows bad gun-shot injuries, severe compound fractures, and other mechanical violence, it is sometimes named *traumatic gangrene*.

Besides these principal divisions of mortification, there is another variety, which is often suspected to be of a contagious nature, and consists in a rapid and very singular demolition of the parts attacked, which are not converted into common sloughs, but into a whitish or ash-colored viscid or pulpy substance, studded here and there with specks of blood. It is a disorder that may be said to be neither like ordinary mortification, nor common ulceration, but something between the two; it has received the name of *hospital gangrene*.

The following are the principal causes by which mortification is produced, and its most remarkable differences and peculiarities are determined.

1. *Inflammation, attended with violence.* Whenever inflamma-

---

* The following are some of Dr. Macartney's views of this part of the subject:—"When the disorganization is produced by an unrestrained effusion of serum, and consists of an unravelling of the structure of the parts, instead of an essential change in the elements of the body, it is commonly distinguished by the name of *moist gangrene*.

"The other kind of disorganisation, which inflamed parts occasionally suffer, is not only attended with the death of the part, but a new and peculiar arrangement of the animal substance, totally different from that, which takes by the death of a part, in consequence of mechanic injury, or its being separated from the rest of the body." Op. cit. p. 35.

tion produces mortification, the stagnation of the blood in the vessels appears to have a chief share in occasioning the death of the parts.

2. *Inflammation, attended with weakness;* whether in the part itself, as exemplified in certain modifications of texture; or in the constitution, as after fever, long courses of mercury, and great reduction of the powers of the system by any cause whatsoever. Great impairment of the constitution, whether brought on by previous disease, as in dropsical and scorbutic persons, or by intemperance, or by a gradual decay of the vital powers from old age.

3. *Inflammation of a specific or malignant nature*, like particular forms of erysipelas, the carbuncle, small pox pustule, malignant pustule, and pestilential bubo.

4. *Stoppage, or serious interruption of the circulation and nervous energy in parts from other causes.* A mere diminution of the nervous energy alone will not occasion mortification, because paralytic limbs live for an indefinite period; but that it facilitates the occurrence cannot be doubted; and hence the greater risk of mortification when the principal artery of a limb is wounded, together with a large nervous trunk, than when wounded by itself. There are two forms of mortification arising from the cessation of *arterial circulation;* the first, depending on a spontaneous rupture of the internal and middle coats of a large artery, and the obstruction of it with coagulated blood, or fibrine*; the second, on the obliteration both of the trunks and branches of the arteries of a limb by fibrine, or by fibrous or osseous substances from some other cause.†

The blood may be prevented from arriving at, or returning from, a part of the body by mere mechanical causes. In both cases, as Professor Carswell remarks, mortification is the consequence of the cessation of the function of nutrition, either from a deficiency of the arterial, or the stagnation of the venous blood.

Dupuytren suspected, that the cause of gangræna senilis might depend upon acute inflammation of the principal arteries of the parts affected (arteritis), which arteries become red, the blood coagulating in them, followed by their obliteration, and a complete stoppage of the circulation. This doctrine has not, however, been confirmed in this country; and Professor Carswell considers some of the appearances described by Dupuytren as evidence of arteritis, rather as indications of the worst forms of phlebitis.

With regard to *ossification of arteries*, as a cause of mortification, Dupuytren looks upon such condition of the arteries and the occurrence of gangrene as a mere coincidence. A simple ossification of arteries, he maintains, does not materially obstruct the flow of blood through them; and certainly it may exist without the circulation undergoing any perceptible check from it. How many bodies, says he, are dissected, in which all the arteries of a limb are found ossified, yet without having produced gangræna senilis? What surgeon, he asks, in operating for aneurism, or in amputating, has not met with arteries completely ossified, and yet the blood passed through such vessels as freely as if they had been quite exempt from disease? He argues, therefore, that the obliteration of arteries, the stoppage of the flow of blood through them, are the real causes of the disease. Dr. Carswell, as already noticed, does not regard arteritis as the cause of gangræna senilis; but he so far coincides with Dupuytren as to state that, in every case of gangræna senilis which he has examined after death, the arteries of the limb were obliterated to such an extent as to interrupt the circulation. In five or six cases, the obstructing cause consisted of a fibrous tissue, formed either in the coats or cavities of arteries, and which had converted these vessels into nearly solid cords of ligamentous consistence. This state was traced from the toes nearly half way up the leg; it was always connected with ossification of the larger branches and trunks of the thigh and other parts of the body. In two other cases, the obstruction depended on extensive ossification of the principal arteries of the limb; and, in several others, on fibrine formed round calcareous spiculæ projecting into the vessels.

---

* See Turner, in Edin. Med. Chir. Trans. vol. iii.

† Carswell's Elementary Forms of Disease," Fasciculus on Mortification.

5. Another common exciting cause of mortification is *irritation* in a thousand forms; friction, stimulating applications, effused urine.

6. *Severe degrees of mechanical injury* from external violence.

7. *Applications* or *agents which chemically destroy the parts*, as high degrees of heat, lightning, concentrated acids, and various caustic substances.

8. *Intense cold*, especially when followed by the sudden exposure of the parts to a much higher temperature. Here, strictly speaking, the cold is only a predisposing cause, and the parts would generally not mortify, if the exciting cause, namely, the sudden exposure to warmth, were not afterwards applied.

9. *Organic disease of the heart*, *aorta*, *or their valves*. This doctrine, I observe, is admitted by Dupuytren, who states, that the generality of individuals, affected with gangrene from arteritis, have either been addicted to intemperance, or are the subjects of chronic diseases of the heart, or of the valves of the aorta, or of the great vessels.

10. Certain *deleterious articles of food*, as the ergot, or cock-spur-rye, or barley mixed with the raphanus.

11. *Specific contagion*, as exemplified in hospital gangrene.

When any considerable portion of the body is attacked with mortification, the whole system is thrown into a state of alarming derangement, accompanied by a sudden and remarkable depression of all its powers.

However, if the sloughing be preceded by violent inflammation, as is generally the case where it is the result of mechanical injuries, the first stages of the complaint are attended with inflammatory fever; the strong actions of which usually cease, either before, or as soon as, the parts are in the state of sphacelus. But the degree and kind of constitutional disturbance are not alike in all cases of mortification. Much will depend upon the extent of the disorder, the nature of the parts affected, and the acute or chronic form of the complaint. When the sloughing is confined to a small portion of the skin, or cellular tissue, and has arisen from acute inflammation, the common symptoms of inflammatory fever may be little or not at all aggravated by what has happened; but, if the mortification be extensive, the countenance will quickly assume a wild cadaverous look, the stomach often be severely disordered, vomiting generally occur, and the diaphragm, being affected with an irresistible spasmodic contraction, a frequent, loud, and distressing hiccough will be produced; at the same time the intestinal canal will be distended with a prodigious quantity of gas, and the surface of the body covered with cold clammy perspirations; the pulse will be small, rapid, and irregular; subsultus tendinum will occur, and the patient, especially in bad cases of *traumatic* gangrene, be soon affected with delirium or coma. In such instances, the utmost prostration of all the powers of life is generally manifested. When things reach this stage, the patient soon dies.

In other cases, the course of the disease is slower, and the mortification would stop, and perhaps life be saved, if the weakening effects of a diarrhœa could be prevented, or the state of the stomach be improved.

The *hiccough*, which I have noticed as a symptom or effect of mortification, deserves particular attention, because it is often one of the chief circumstances by which we judge of the state of internal parts threatened with mortification. Thus, it is a symptom which every experienced surgeon has a well-founded dread of in strangulated hernia, where it was formerly regarded as a sure indication of gangrenous mischief within the hernial sac. But this precept was carried beyond the limits of truth. I have in several instances operated upon strangulated hernia, where hiccough was one of the symptoms, though no portion of the protruded bowels was in a mortified state.

In *chronic mortification*, or *dry gangrene*, the constitutional symptoms are often of a slower character, and the patient may live several weeks, with a pulse varying from 100 to 120, with his digestive functions tolerably well performed, and his intellects clear, until perhaps about a week before the fatal result. Of this fact I saw a remarkable example in a gentlemen, whom I attended with Sir Astley Cooper and Mr. Hughes of Holborn.

All mortifications from a mechanical obstacle to the venous circulation present one common character, viz. an excessive accumulation of blood in the venous trunks, branches, and capillaries of the affected part. Owing, however, to the accumulation of serosity beneath the skin, as Dr. Carswell observes, such venous congestion is not at first perceived in that species of mortification of the legs which succeeds to disease of the heart. Indeed, as this able pathologist notices, the first local sign that an obstacle exists to the return of the venous blood from the inferior extremities, is manifested by slight œdema around the ankles, which increases and spreads throughout the cellular tissue, and the skin assumes a smooth, pale, and waxy appearance. At length, the subcutaneous veins gradually increase in bulk and number, coalesce in several points, and communicate a slightly mottled aspect to the skin, of a dull red or purple color. On one or more of these points, where the congestion is greatest, phlyctenæ, or large bullæ are formed. When these burst, the skin underneath presents a dark red, or brown color, and is soon converted into a dirty yellow, or ash-grey slough. The separation of the slough is sometimes preceded by an increase of redness in the surrounding skin, evidently inflammatory; but, in other instances, the redness is very slight, and plainly owing to mere venous congestion, occasioned not only by disease of the heart, but also by the pressure of the serosity accumulated in the cellular tissue of the limb.*

When a part, or limb, is seized with mortification, *the blood coagulates in the large vessels for some distance from the boundary of the dead parts.* It is on this account that the separation of sloughs is not commonly attended with hemorrhage, which is afterwards prevented, not only by the clots formed in the arteries, but also by the effects of the adhesive inflammation.

The coagulum always extends within the vessel as far as the first important collateral branch. This fact explains a circumstance sometimes noticed in practice, viz. when the incisions in amputation are made within a certain distance of mortified parts, there may be little or no bleeding from the divided vessels.

Hemorrhage, on the detachment of a slough, is certainly not a common circumstance: it is seen, however, now and then, when the disease is a combination of phagedenic ulceration and sloughing, and sometimes as a consequence of gun-shot wounds, implicating the side of a considerable artery; but not in ordinary cases.

The *prognosis* is much influenced by the consideration of the nature of the exciting causes, and whether they admit of removal, or not. If the disorder originate from organic disease of the heart, or from extensive ossification of the arteries, combined with some other cause (for this alone must not, I think, be set down as adequate to the production of mortification), it may be regarded as incurable, because we have it not in our power to remedy those particular states of the heart and arteries which excite the disorder.

---

* See Carswell's "Elementary Forms of Disease." This work contains the best description of mortification of inferior extremities from disease of the heart, ever published.

On the other hand, if mortification arise from the presence of any kind of irritation, pressure, or friction, which can be effectually removed, we may entertain the hope of stopping the extension of the complaint. Thus, if sloughing of the cellular tissue of the perinæum and scrotum arise from the irritation of effused urine, we may, by making free incisions for the discharge of such fluid, and by passing a catheter or tube to hinder the renewal of the effusion, remove the exciting cause, and thus stop the gangrenous mischief. However, after urine is once effused, so irritating is it to the cellular tissue, that more or less sloughing will generally follow, even though ample and deep incisions for its escape be made with the utmost promptitude. Still, however, the practice is useful in preventing the extension of the mischief. In all cases of mortification, the prognosis depends also very materially upon the age, strength, and constitution of the patient; the greater or lesser importance of the part affected; the rapid or slow progress of the disorder; its extent, and the circumstance of its proceeding, or not, from internal causes.

A mortification in what is familiarly called a *bad* habit of body, a constitution ill suited to bear any disease favorably, may be set down as exceedingly dangerous; while a limited sloughing from external violence, in a healthy person, may not be attended with any severe or perilous symptoms whatsoever.

On the other hand, if mortification be not of too great extent, and arise in a healthy person from the presence of any kind of irritation, pressure, or constriction, which can be promptly and effectually removed, there is the fairest prospect of bringing the case to a favorable termination. If the part attacked by mortification, however, be one whose functions are of high importance in the animal economy, the case is attended with great peril, even though the individual may be of an excellent constitution, and the portion of the organ destroyed but of small extent; a fact frequently illustrated in strangulated hernia, attended with mortification. The rapid progress of traumatic gangrene, so quickly and often inducing coma, delirium and death; the slower, but still more certainly destructive course of gangræna senilis, forbidding in its early stages an operation, on account of its intimate association with internal causes; and the well known severity and disastrous consequences of hospital gangrene, must always be remembered in giving our judgment concerning the issue of this disorder. Great prostration of strength, a low, rapid, faltering pulse; a stomach which can retain neither food nor medicine; and an attack of diarrhœa, especially when joined with coma or delirium, are symptoms leaving little or no hope of recovery.

In the *treatment* of every species of mortification, there are three principal indications. 1. To endeavor to stop its progress. 2. To promote the separation of the mortified from the living parts. 3.

To heal the ulcer resulting from the loss of substance, or, where an operation has been deemed necessary for the fulfilment of the second indication, to cure the wound thus produced.

1. With respect to the first of these indications, it natually leads to the object of ascertaining and removing the original cause of the disorder: I mean that cause which first gave rise to the intense inflammation of the parts, and which, perhaps, may still continue to operate. This is a common principle, which should be observed here, as well as in all other parts of surgery. Sometimes we have it in our power to remove the exciting cause altogether; as, when we let out by suitable incisions, extravasated urine, and hinder its further effusion by the judicious employment of the catheter; or when we discharge from the cellular tissue the fluid, which occasions a prodigious distention of that texture in the severe forms of phlegmonous erysipelas; or when we take away extraneous substances, splinters of bone, and remove and diminish irritation in a variety of forms. Frequently also sloughing is produced and kept up by the employment of hurtful remedies, and then the change to a better practice is the same thing as removing the cause of the disease in other instances, and has an equally beneficial effect. In general, however, when gangrene arises from intense inflammation, the exciting cause is only momentary: it has already ceased; but the injury, which the parts have sustained from it, is of a more lasting nature, and must be followed by a high degree of inflammation, and sloughing to a greater or lesser extent.

There can be no doubt, that the extent of mortification may be considerably influenced by the mode of treatment, adopted during its incipient stage, termed gangrene. When the disorder is the effect of inflammation, we are bound to believe, nay, we see, that the living circumference is inflamed in the highest degree. Reason and observation, therefore, seem both to concur with respect to the general propriety of antiphlogistic measures in this state and species of mortification, especially leeching, saline aperient medicines, and calomel with opium. The plan, however, is to be pursued with moderation and caution: it is right, so long as inflammatory fever and acute local inflammation are co-existent with mortification; but, even under these circumstances, evacuations must not be resorted to with the same freedom and frequency, as in examples of inflammation unaccompanied with mortification. In particular, venesection is to be ventured upon only in young, robust, plethoric subjects. The necessity of this kind of circumspection depends upon the fact, that, whenever a considerable portion of the body mortifies, the constitution immediately feels the shock in every part of it. There is hardly any interval between the genuine inflammatory fever, in which the action of the sanguiferous seems to proceed even with preternatural force, and another state of the constitution, in which the predominating symptoms are prostration of strength, and violent agitation of the whole nervous system. In fact, more or less debility always rapidly supervenes; and if the patient be further lowered by the lancet, purgatives, and too spare a regimen, his condition will be rendered hopeless.

Some years ago, the treatment of gangrene and sphacleus was often conducted upon principles which had little foundation. It was presumed that cinchona had a specific virtue in stopping and resisting the progress of the disorder. To this medicine, diluted sulphuric acid was added, when a general tendency to putrefaction was suspected in the system; or cordials and aromatics, as wine, brandy, musk, ammonia, confectio aromatica, &c., when there was great prostration of strength; and opium, when severe nervous symptoms, and extreme pain were experienced. Musk and ammonia were recommended many years ago by Mr. White, of Manchester, in examples attended with spasmodic twitches. My friend, Dr. Gibson, Professor of Surgery in the University of Pennsylvania, gives his testimony in favor of the latter medicine, and also speaks favorably of the effects in some cases of camphor, with or without opium, small doses of the chloride of mercury, and of liquor ammoniæ acetatis combined with laudanum.*

The opinion, respecting the specific power of bark for the stoppage of mortification, is rejected by every modern surgeon of judgment and experience; without the denial, however, that it is a medicine, which, in particular states of the disorder, may be administered with advantage. Even then the benefit never arises from the specific power, which it was formerly supposed to have, of stopping mortification, but from its being an eligible bitter, by which the tone of the digestive organs may sometimes be improved. It is not long since it was the custom to prescribe it in powder, or substance (as it was termed), and in as large quantities as the patient could be prevailed upon to swallow. But no sooner was it clearly ascertained that the utility of bark did not really depend upon its specific virtue, than the plan of cramming patients with it was universally abandoned; and it is now only administered in such moderate and reasonable doses, as are not likely to disorder the stomach and bowels, and defeat the very purpose for which alone it can ever be justly recommended. It is not, however, in the early stage of mortification, combined with acute inflammation, that bark, prescribed in any way, can be of service.

When mortification happens from an external local injury in a sound constitution; when it no longer spreads, and the living margin appears red for a small distance from the line of separation, bark is clearly unnecessary.

---

* See "Institutes and Practice of Surgery," vol. i. p. 28. ed. 5. Philadelphia, 1838.

Mortification, according to its particular nature, causes, and circumstances, may be attended either with sympathetic inflammatory fever, or with another fever, which is characterised by extreme debility, and is either like typhus, or the disorder sometimes described under the name of *sympathetic irritative fever*.

The first fever takes place when mortification arises from external causes in a healthy constitution. Here bark is usually hurtful. The other state of the system may undoubtedly require it, though, if the fever be what is called irritative, and great excitement of the nervous system, delirium, picking of the bed-clothes, subsultus tendinum, &c., prevail, anodynes, antispasmodics, blisters, and local treatment, will do a thousand times more real good, if any chances of life still remain, than bark in any dose or formula whatever.

In condemning this medicine, however, for certain states of mortification, I am far from wishing the reader to suppose, that even in the progress of these very identical cases it may not sometimes become necessary, although not at all indicated at an earlier period. Every experienced surgeon knows, that the natural change of circumstances in the course of numerous diseases renders the exhibition of some medicines absolutely indispensable, which, had they been given at first, would have had the most pernicious effects. When the inflammation surrounding the sphacelus has abated, the patient is low, the appetite bad, and the kind of fever and state of the chylopoietic viscera are not such as to prohibit bark, it should be administered with aromatic confection, wine, fermented liquors, and a light nutritious diet. The sulphate of quinine should also not be forgotten, as a very convenient preparation, which the stomach and bowels will generally bear well. If delirium occur, camphor or musk ought to be prescribed, and a blister applied to the head. In many of these cases, also, the patients would be carried off by diarrhœa, were not the surgeon particularly attentive to the diet, and prompt in the judicious administration of opium, the mistura cretæ, &c. Indeed, with respect to opium, and the preparations of it, the muriate and acetate of morphia, they are perhaps the most valuable of all the internal remedies, employed in the treatment of mortification, and should be employed in every stage and form of the complaint, attended either with severe pain, or spasmodic or nervous symptoms, and they ought not to be given merely at night, but every four or six hours, so as to keep the constitution under their influence.

With regard to local applications, for cases of mortification, attended with acute inflammation, experience appears to decide in favour of common emollient linseed poultices and fomentations. When the gangrenous part is turned into a darkish, or black, fibrous insensible mass, it is, indeed, of little consequence what is applied, to it, as the living circumference claims almost exclusive attention. Both during the extension of the disorder, and afterwards, when the sphacelation has stopped, a simple linseed poultice, or one containing a proportion of finely powdered recently burnt charcoal, is as good an application as can be employed. Some surgeons are partial to fermenting poultices, and with these not much fault can be found; for, though perhaps no particular good can be strictly imputed to their supposed antiseptic quality, the carbonic acid gas produced by them is not stimulating enough, nor sufficiently in contact with the living flesh, to counteract their good effects as emoilient applications. They have always appeared to me better calculated for mortification, unattended with intense inflammation, than for the particular cases which we are here considering.

As I have repeatedly said, it matters not what is put upon such parts as are actually dead, and if the surgeon choose, he may lay upon them turpentine, spirituous balsams, camphorated spirit, a solution of the chloruret of soda, or lime, the pyroligneous acid, a lotion of creosote, or anything else which he may prefer, with the view of checking the fetor and putrefaction. But, except in some instances of phagedæna gangrænosa, where it is necessary to destroy the textures directly connected with the parts affected, it is of high importance that the living flesh around and underneath a slough be not injured and irritated by any sort of applications. No one, who has sound ideas of the nature of the animal economy, would talk of invigorating the parts with spirits and balsams, in order to avert mortification. Yet, once so prevalent was this doctrine, that it was a frequent practice to cut and scarify the parts for the express purpose of letting such applications have free ingress to the subjacent living textures.

Incisions and scarifications in grangrenous parts can do no good, if they are merely made in the sloughs; and, if they extend through the dead to the living flesh, they are not only likely to effect no rational purpose, but must be productive of pain, hemorrhage, and frequently of fresh sloughing. When, however, a slough is large, and a part of it loose, the cutting away such portion is commendable on the principle of lessening the fetor. Were also much sanies to lodge under a slough, a careful incision through the dead part might be useful in affording an exit to the matter. But this proceeding can never be justifiable when the living parts are to be irritated or wounded.

2. The second general indication is to promote the separation of the mortified from the living parts.

Although a slough may be scratched, or cut, without pain or harm to the patient, it cannot be pulled away immediately after its formation, without pain, hemorrhage, and even a risk of renewing the spreading of mortification. The dead part is yet adherent to the living flesh, and cannot be prudently taken away before the absorbents have removed the particles of matter, which compose the uniting medium. The separation of dead from living parts is a vital process, not explicable on physical principles, nor by the laws of dead matter. When it is about to take place, a red line, varying in breadth in different cases, and said to be produced by the adhesive inflammation, usually appears on the living surface, contiguous to the dead. The adhesive inflammation, in fact, seems to be the means which nature employs for stopping the progress of mortification, and preparing the living surface for the separation which is about to be produced. By it, she fills the cavities of the cellular tissue with coagulating lymph, assists in closing the extremities of the blood-vessels, and establishes the commencement of those operations by which granulations are to be formed, and the loss of substance repaired. Soon after the formation of the red line of separation, slight solutions of continuity may generally be seen, beginning at various points, and resembling very minute ulcers, which, uniting together, form a hollow line, or chink, which extends all around between the dead and living parts. This loss of substance, which is at first superficial, generally proceeds more and more deeply, till the separation of the sloughs is entirely affected. In this process, which does not materially differ from that of common ulceration, the absorbent vessels are actively engaged, and it is by them that the particles which form a link between the dead and living flesh are removed. From the moment that the separation commences, a discharge, at first of a serous, and afterwards of a puriform appearance, begins to take place from the line of detachment, and it becomes more and more abundant in proportion as the falling off of the slough exposes the subjacent raw granulating surface. In young subjects, and in vigorous constitutions, the separation of the sloughs is accomplished with much more celerity than in the old and feeble. The texture and situation of the parts affected make also a considerable difference in this respect, and, generally speaking, the harder and less vascular they are, and the more remote from the source of the circulation, the longer they are in throwing off their sloughs.

When a part, or limb, is seized with mortification, the blood coagulates in the large vessels, for some distance from the line which bounds the sphacelation. Hence, the separation of the sloughs is not usually attended with hemorrhage, and the security is generally still further increased by the effects of the adhesive inflammation already described. The cause of the formation of the coagulum in the vessels, as Mr. Hodgson remarks, is by no means evident, although it is probable that the condition of a mortified vessel may interrupt the passage of the blood through it, and, consequently, a coagulum is formed, extending to the next important collateral branch. It is also the coagulation of the blood in the arteries, near a sphacelated part, which accounts for there being sometimes no hemorrhage of importance, nor any occasion for ligatures, when amputation is performed a little above the line of separation.*

With the exception of cases in which amputation of the limb is urgently indicated, the separation of a slough should generally be left as much as possible to nature. All that the surgeon can usefully do, is to take away every portion of the slough as soon as it is entirely separated from the living textures. An opposite line of conduct, as I have already stated, would often excite unnecessary irritation, pain, and hemorrhage, and even renew the spreading of the disorder. A trivial degree of violence will sometimes bring on the latter evil, nor can we be surprised at it, when we advert to the deranged state of the whole constitution, always resulting from the effects of an extensive mortification. If it be at all practicable to expedite the process by which a slough is thrown off, the good is to be derived rather from general than from local treatment. By internal medicines, a judicious regimen and diet, and especially by attention to ventillation and cleanliness, the general health may be improved, and, in this manner, the system enabled to throw off the sloughs, or dead parts, with greater expedition; but until they are actually loose, we cannot interfere for the purpose of taking them away. I know of no applications, which have any particular virtue in quickening their detachment, and the more simple they are the better. In fact none are better than common linseed poultices, with or without a proportion of powdered charcoal or some of the solution of the chloruret of soda: or, if the surgeon like, he may have recourse to the fermenting cataplasm already specified. Much stress has been laid upon the usefulness of antiseptics and tonics as local applications; as a solution of the chloruret of soda in water, or camphor mixture, turpentine, camphorated spirit, &c. Bark in a variety of shapes has also been used for covering the parts affected. So far as my experience goes, I should say, that the cases, in which the chlorides or chlorurets of soda and lime, carrot and fermenting poultices, and various acid or spirituous or other lotions, prove most useful, are those in which mortification presents itself in the characters of phagedæna and hospital gangrene. In these instances, concentrated nitric acid and the liquor arsenicalis, mixed with an equal quantity of distilled water, have obtained high repute. It is also in such cases that the actual cautery is still sometimes made use of abroad.

3. The third general indication is to heal the ulcer, or, in the event of amputation, the wound resulting from the loss of substance. But, on this topic, I need not dwell at present, as the principles, on which this indication is to be fulfilled, are explained in the respective articles on wounds, ulcers, and amputation.

---

* See Petit in Mem. de l'Acad. Royale des Sciences, an. 1732. Thomson's Lectures, p. 552., and Hodgson on Diseases of Arteries and Veins, p. 13. 8vo. Lond. 1815.

GANGRÆNA SENILIS.

This is generally an example of *chronic* mortification, and also of *dry* gangrene, though, in respect to the rate of its progress, and the quantity of fluid about the destroyed textures, there is considerable difference in different cases. Thus some preceed to their fatal termination in a week, as happened in an instance which I lately attended with Mr. Baker of Staines; while others do not terminate in this manner till several weeks have elapsed, as was the case with a gentleman in Gray's Inn, whom I attended with Mr. Hughes of Holborn. In Mrs. W. of Guildford Street, who was a patient of mine, the disorder continued more than nine months before she fell a victim to it, and then it had not destroyed the whole of the foot. The disorder is always, however, completely different from that which follows the ordinary forms of acute inflammation, coming on more insidiously, and at first with less threatening symptoms, though, if possible, tending with still greater certainty to a fatal result than any other species of mortification. The first change usually noticed is a dark red purple, or almost black, discoloration of the fleshy or under portion of one of the toes, without, in general, any previous swelling, increase of temperature, or sensibility of the part. I have known the disorder begin on other parts of the foot: thus, in Mrs. W., above referred to, it commenced on the heel. Some few examples of its attacking the upper extremity have come under my notice. At this present time, there is an old woman in University College Hospital under my care, the end of several of whose fingers were attacked; the disorder has stopped, and she is now recovering, with the loss of the third phalanx of one of the fingers. I should mention, that she also had some sloughing of the integuments of the foot. Dupuytren gives one instance of its commencement in the fingers. In the winter of 1834-35, a woman, aged seventy-five, was in our hospital, one of whose arms perished nearly up to the axilla, from this species of gangrene, and, nature having separated the dead from the living parts down to the bone, this was divided with a saw, and the woman recovered.

Frequently while the skin about the toes is of a deep purple color, it is of a lighter hue higher up the limb, and still higher up only mottled or marbled. Here the parts begin to give a sensation to the hand of great coldness, which increases the nearer the part examined is to the foot. Still the patient retains the power of moving the ankle; a circumstance, explicable by the fact, that most of the muscles of the foot ascend nearly as high as the knee, to which point the disease has not extended. If the femoral artery be now examined with the fingers, its pulsations will be felt to be very feeble, or the vessel converted into a hard, almost incompressible cord.

Gangræna senilis begins at the greatest distance from the source of the circulation, almost always with a mere discoloration or spot on the side or inferior part of one of the small toes, soon followed by an uneasiness, numbness, and an extraordinary fall of temperature in the foot. Although the disease is usually regarded as dry gangrene, the cuticle rises up here and there in the form of vasications, filled with a dark very fetid serosity, and on their bursting, the black mortified cutis may be seen at the bottom of them. When the disease creeps up the limb very slowly, the swelling of the parts about to perish may be very trivial; but, in other examples, there may be inflammatory redness, accompanied by heat, pain, and tumefaction, and the upper part of the leg may be of twice its natural size. According to Dr. Carswell, the bulk of the affected parts depend chiefly on the situation and extent of the obstacle to the circulation. If the obstacle be extensive, the quantity of blood admitted to the foot is too small to give rise to congestion ; and this not taking place, there is little or no effusion of serosity. Hence there is no increase of bulk in mortification from this cause; and, if the obstruction has been effected slowly, the foot and leg may even be atrophiated, previously to their being attacked with mortification, the dead parts being shrunk, dry, and indurated.*

Sometimes the disease in its early stage is attended with great constitutional disturbance, intolerable pain, constant restlessness, a small, frequent, irregular pulse, hiccough, vomiting, twitches of the muscles, and coma or delirium. Under such circumstances the patient usually dies by the time the mortification has reached the ankle, or even earlier, that is, in eight or ten days. In other examples, however, the patient at first suffers but little constitutional derangement, and is surprised to hear that a small discoloration of one of his toes, and a degree of uneasiness in the foot, should be a case of considerable danger. This was singularly illustrated in the gentleman in Gray's Inn, whom I attended in the summer of 1828, with Sir Astley Cooper and Mr. Hughes. The case was also remarkable as presenting an instance of the disorder in both legs at once. But notwithstanding this double attack, the constitutional disturbance advanced so slowly, that the patient used to eat a mutton chop for dinner every day, and to digest very well until within three days of his death, which did not take place till nearly five weeks after the commencement of his sloughing. The pulse during the greater part of this time was from 100 to 110, though occasionally it rose to 130, and the intellects were clear until the final stage. In this interesting case, two circumstances were particularly remarked: —1st. That the disease never spread, without each extension of it being preceded by violent burning pain in the part about to be destroyed, so that a correct judgment could always be formed beforehand from the degree of suffering, whether the next extension of the disorder would be considerable or not. 2dly. That the process of mortification, and its appearances in one leg, were totally different from those presented in the other. In the left, the disorder began on the inside of one of the little toes; in the right, a general diminution in the temperature of the foot and leg came on very gradually, with scarcely any discoloration of the skin, any detachment of the cuticle, or any particular change in the appearance of the toes. The coldness was followed by a total loss of sensibility in the parts, and the cessation of the circulation, and every other action in them. The skin was in this leg shrunk, dried or mummified, but it was little changed in color. In University College Hospital, there is at this present time (June 1839), a woman, aged about forty-five, both of whose feet have been destroyed by gangræna senilis. In one limb, the parts are separating; and, in the other, the line of demarkation is beginning to show itself, but, from the feeble state of the pulse, occasional delirium, and impairment of the functions of the stomach, I judge that the patient cannot live many days.*

---

* See Dr. Carswell's "Illustrations of the Elementary Forms of Disease," Fasciculus 7.

With respect to the loss of temperature in parts about to be destroyed by gangræna senilis, Dupuytren states, that he has carefully noticed the thermometer, that such parts, before they perish, actually, become much colder than any of the surrounding media. It seems to be well ascertained, that this is a species of mortification arising from obstruction in the arterial system. The results of Dr. Carswell's investigations confirm this view; for, though he does not coincide with Dupuytren in referring the cause of such obstruction to arteritis, he has found the arteries more or less blocked up with fibrine or other deposits. It is not perhaps completely settled, how far an ossified state of the arteries should be set down as a cause. In elderly persons, some of these vessels are always ossified; yet, in the parts to which they are distributed, nutrition appears to go on tolerably well, and the textures usually escape gangrene. It may be argued, therefore, that as one form of chronic mortification is mostly met with in persons of advanced age, in whom there is generally some ossification of the arterial system, whether mortification happen or not, such ossification cannot be the cause of mortification, when this does happen, but only an accidental complication or coincidence. I believe, however, that it must be regarded at all events as a predisposing cause, and that when joined with organic disease of the heart, an impaired constitution or derangement of the health, it must promote the oecurrence of gangrene. One can hardly suppose that an artery, when converted into a rigid bony tube, can be so will calculated for carrying on the circulation, as it is in its naturally elastic and contractile state. Yet, without some further cause of impediment to the blood's motion, no mortification would arise.

---

* This prognosis was verified. In the *post mortem* examination, ossification and thickening of the semilunar valves of the aorta were observed, and tubercular ulceration of the cœcum and beginning of the colon. The femoral, tibial, and peroneal arteries, and the dorsal artery of the foot, in each limb were slit up, but no obstruction of them with any kind of substance existed. As no fine injection was thrown into the vessels, it was impossible to offer an opinion respecting the actual state of the minute vessels, which, according to Cruveilhier, are essentially blocked up and obstructed, whatever may be the state of the arterial trunks, which he represents as an accidental circumstance, and varying in different cases.

Dupuytren believed, that this chronic form of mortification is owing neither to debility nor impairment of constitution, nor to ossification of arteries, but to arteritis, or an inflammation of the inner coat of the principal arteries leading to the parts affected, whence follow coagulation of the blood in them, and their obstruction with coagulating lymph, so that if amputation be performed, no ligatures are required. Old age and debility, he maintains, are not the cause, because he has seen the same description of mortification in a child ten years of age, in a young woman of twenty-two, and in a person of forty. At the same time, he acknowledges that hard drinking, and disease of the valve of the heart, are generally concerned as exciting causes of arteritis, and that such arteritis may take place in the diseased arteries of old subjects, as well as in the sound ones of young persons. With respect to these points, if they were all admitted, they do not seem to me to invalidate the great truths, that this species of mortification is rare in young individuals, and that it occurs chiefly in persons above fifty, whose constitutions have been impaired by time and mode of living, and whose arterial system is in a state demonstrating an obstructed circulation in the limb.

[Gangrena senilis arises sometimes in consequence of Paralysis of the arteries being sound, and capable of carrying on the process of nutrition. I have seen two cases of dry mortification which depended upon that cause, and they were both of them females, one of them was fifty-four, and the other sixty-five years of age.

The first of these two cases I saw after the disease had extended to the ankle and advised amputation—it was performed—she recovered and lived, and enjoyed good health for ten years.

The other female suffering from gangrene produced by the same cause, sank from constitutional irritation.

When the mortification, on the contrary, depends upon ossification of the arteries as is generally the case in old men, we can expect but little from an amputation, and it is rarely regarded good practice to advise it.]

Dupuytren declares, that by means of venesection and opium, he has saved two thirds, or even three fourths, of his patients; whereas, the disease, as it is commonly treated in this country, is generally fatal, the number of persons living till its destructive process stops, and the dead parts are separated by nature, or the amputating knife, not exceeding, perhaps, one in twenty. Were Dupuytren's practice to be attended with so much greater success than our own, doubtless it should be immediately substituted for the latter, little as our confidence might be in his doctrine of arteritis being the cause of the disease. I fear, however, that he has either exaggerated his success, or frequently mistaken the kind of mortification in which he employed the lancet with advantage. When we find him describing this mortification as common in young persons, there seems to be indeed some reason for the latter suspicion.

I have heard of the practice being tried in one or two examples in London, but without success. Dr. Gibson, of Philadelphia, relates the particulars of a case under Dr. Carmichael, of Virginia, in which both feet were attacked with dry gangrene, and Dupuytren's plan was tried. "The first bleeding to faintness afforded great relief from the pain, as it did on every trial, which was repeated during the disease not less frequently than eight or ten times. Purgatives assisted, as usual, in the antiphlogistic treatment, and the most agreeable local adjuvant was snow or iced water." The blood was buffy and cupped. Opium was sparingly used. About the sixth week, Dr. Carmichael removed one of the legs below the knee, and, upon inspection of the artery, it was found so filled with granulated, albuminous, or fiibrous matter, that no ligature was applied, or tourniquet used, nor was there the least hemorrhage. In the tenth week, the other limb was amputated. The patient gradually improved, and became convalescent, but died shortly afterwards.*

In gangræna senilis, opium is a medicine of much greater value than bark. This was a truth particularly insisted upon by Mr. Pott, who, however, rather overrated the power of opium, which he represents almost as a specific or sure means of stopping the extension of the disease. I believe it to be the most useful of all medicines in this example of mortification, but by no means endued with so much power over the complaint as Mr. Pott's statements might lead a young surgeon to imagine. In fact, when we advert to the cause of the disorder, what medicine can be expected to have great power over it? Dr. Gibson has tried opium both in small and very large doses, without finding the expectations held out by Pott realised in a single instance. In one example, he began with moderate doses, and gradually increased them, till the patient took 500 drops of laudanum every twelve hours; yet little relief was experienced, and the case had a fatal termination. When opium is prescribed, the patient should be kept continually under its influence, and the dose therefore be repeated every four or six hours, either in the common forms, or those of the acetate or muriate of morphia.

---

* See Gibson's "Institutes and Practice of Surgery," vol. i. p. 36. ed. 5.

Besides opium, other medicines have been extensively tried—as sulphate of quinine, diluted sulphuric acid, hyosciamus, camphor, musk, æther, the subcarbonate of ammonia, wine, and various cordials.

The best topical applications are those which are not productive of irritation; hence, emollient poultices and fomentations are generally preferred. Surgeons often try the solution of the chloride of soda or lime; but, the application is merely commendable as a disinfecting agent, and not on the ground of its having any specific virtue in stopping mortification. The chlorides of soda and lime I have seen fairly and freely employed; but what experience revealed will only justify this report of them: they lessen the disagreeable effluvia, but they neither check the mortification, nor afford ease to the patient.

About a year and a half ago, an old man was under my care in University College Hospital, with gangræna senilis of one of the toes, in a recent stage. I had then just learned from Sir Benjamin Brodie that in Greenwich Hospital, where this disease is common amongst the aged pensioners, the practice had been followed of covering the whole limb with lamb's wool, in order to maintain its temperature, and this sometimes with a beneficial result. I tried the method in the case here referred to, and the man recovered with the loss of part of the toe.

As this form of mortification proceeds from internal causes, it is one to which the ancient rule applies, that amputation ought not to be undertaken until the red line of demarcation is completely formed, and the sloughing has decidedly stopped.

MORTIFICATION FROM DEBILITY.

Besides the foregoing species of mortification, there are others which are preceded by a state of local and general debility, where (to use the words of Professor Carswell) the physiological and physical properties of the fluids and solids are so modified, that every function of the economy is slowly, ineffectually, or imperfectly performed. Such is the sloughing of the gums, cheeks, palate, and fauces, in persons whose systems are universally deranged by the abuse of mercury, and such is mortification coming on as the effect of scorbutus, typhoid fevers, and the disease termed cancrum oris. In mortification from debility, a local accumulation of blood generally constitutes the first perceptible change in the part. This may take place from the part being subjected to pressure, slight friction puncture, or other similar causes. "In some of these cases the blood accumulates, partly from the influence of gravitation and partly from compression of the veins."

The treatment of all these descriptions of mortification requires the removal of the predisposing and exciting causes. The constitution must be strengthened, and its derangement, whatever that may be, rectified, and the pressure, friction, or other irritation, acting as the exciting cause of mortification, removed if practicable.

MORTIFICATION FROM INJURY OF LARGE ARTERIES AND NERVES.

In the arrangement of the arterial system, nature seems as if she had foreseen the danger that would arise from an interruption of the supply of blood, and she has, therefore, so multiplied the reciprocal communications or inosculations, in all the different orders or branches of this system of vessels, that the largest trunks are tied almost daily by the enterprising hand of the modern surgeon, and yet, if there be no other causes concerned, this single one is rarely followed by mortification. She appears, however, not to have extended in an equal degree a similar cautious and provident arrangement to the nerves. The destruction of a principal trunk, in this latter system, is invariably followed by paralysis; and, when this circumstance is coupled with the division or ligature of the principal artery of the same limb or part to which the branches of that nerve are distributed, the chances of mortification are much increased. There are, however, some facts recorded, which prove, that the communications of some of the smaller nerves are sufficiently direct to qualify them to become, in point of function, substitutes for each other.

I have said, that the division or ligature of the main artery of a limb and of the principal nerve, together, may occasion mortification. Cases are related in which the consequences were only a paralysis and wasting of the member; but Delpech was not aware of any instances of this kind, where the lower extremity was the part concerned; and, with respect to the arm, which is not supplied by a single nerve, hardly any sort of accident can injure the whole of the brachial plexus; the medium being the nerve, which is commonly wounded, or tied, with the artery. He observes, however, that notwithstanding the advantage of several nerves, it has almost always happened, that when the nerve accompanying the axillary artery has been included in a ligature with it, the limb has mortified.*

It is true, that, in many of these cases, we are also to take into the account the share which a large, extensive wound of the soft parts, or their contusion, laceration, &c. have in the production of gangrene. We rarely or never see a case, in which the injury simply consists in the division or ligature of the main artery and one of the principal nerves of a limb, unaccompanied either with great additional injury, much weakness from the profuse and sudden hemorrhage, the irritation of a previous operation, the injection of the cellular tissue with blood, or a diseased state of the member, any of which conditions may be such as to have considerable influence in bringing on gangrene. On the whole, perhaps, we are not yet authorised to infer, that the mere interruption of the circulation through the main artery of a limb, and the simultaneous stoppage of the nervous influence derived from one of the principal nerves of the member, would generally occasion mortification, if there were no other additional violence, nor injury, existing in the part or constitution.* Whatever may be the result of future experiments upon this point, no doubt, I think, can be entertained of the fact, that when the stoppage of the circulation through the main artery of a limb is conjoined with loss of the nervous influence in the same member, there is always a much greater risk of mortification, than if the case were simply an interruption of the flow of blood through the vessel. Indeed, so great is the success which now attends operations on aneurism, that I might perhaps assert, with perfect accuracy, that gangrene never arises solely from the ligature of an arterial trunk unless the patient be of advanced age; the circulation languid from previous debility; many of the collateral branches destroyed or injured; or some other important cause co-operate in producing the evil.

---

* Precis des Maladies reputees Chirurgicales, t. i. p. 98.

When mortification follows the ligature, or division, of a principal artery and nerve, the part is from the first cold, insensible, heavy, benumbed, and motionless; its natural heat is permanently lost; the pulsation of its arteries cannot be felt; the cuticle separates; the skin becomes brown and shrivelled; and fetid exhalations soon leave no doubt of the nature of the mischief. This species of gangrene is usually very extensive, being a sphacelus affecting the whole of the limb. It is somewhat less dangerous when it comes on later, and begins at the extremity of the limb; under which circumstances, its progress is ordinarily slower, and its effects sometimes restricted to a partial destruction of the member.

When once this kind of mortification has arisen, every means which it is in the power of the surgeon to adopt will be found insufficient to stop its progress. Hence, in tying the main artery of a limb, too much care cannot be taken to exclude from the ligature the accompanying nerve. We should also avoid every thing likely to obstruct the circulation through the collateral branches and capillary system of vessels. After operations for aneurism no compression should be employed, and the limb kept moderately warm.

---

* Some years ago I was present with Mr. G. Young at an operation, in which Mr. Lawrence divided by a circular incision, not only the principal arteries and nerves of the finger, but every fibre of the part, with the exception of the tendons and bone. Yet, contrary to all expectation, the blood still gushed profusely from vessels, which could only receive their supply of blood through the medium of such ramifications as passed through the tendons and bone. It was equally curious, that though the principal arteries and nerves were all fairly divided, and the cut carried entirely round the part, mortification was not the consequence. The operation succeeded in checking the progress of an aneurism by anastomosis, which had increased and become attended with many unpleasant symptoms, notwithstanding the radial and ulnar arteries had both been previously taken up by Mr. Hodgson. Some account of this case is given in Medico-Chir. Trans. vol. ix. part 1. p. 216.

When the case is decidedly an extensive sphacelus, the only chance of preservation depends upon the immediate performance of amputation, high up; and, if practicable, above the place where the artery has either been divided or tied. In certain examples, however, in which the first appearance of mortification does not happen till some days after the injury, when the sloughing occurs at the extremity of the limb, and is slower in its advances, the disorder will sometimes terminate in a partial destruction of the integuments of the hand, or foot, and the limb may be saved. But here the surgeon must be most vigilant; for if, in his anxiety to avoid operating, he give the disease time to extend up the limb, the patient will certainly lose his life.

MORTIFICATION FROM PRESSURE.

Somewhat related to the kind of mortification, which we have just now described, is that which originates from pressure, whereby the circulation in the smaller vessels, and the nervous influence in the parts, are interrupted. However, the great extent of the capillary system, and the prodigious number of itsi nosculations, make the circulation in it so free, that it must be a powerful and long-continued pressure to stop this important function. The cause may act either upon a limited point of the external surface of the body, or upon the whole circumference of a limb; and, in both instances, the effect may extend to a greater or [lesser depth. When the constitution is enfeebled, pressure much more readily brings on mortification. Of this every surgeon of experience must have seen repeated proofs in the mortification which attacks the integuments covering the sacrum, os ilium, trochanter major, scapulæ, heels, and elbows of patients who have been long confined in bed by fevers, injuries of the spine, bad fractures, &c. The constant pressure of such parts of the skin, between the bedding and bony prominences, obstructs the circulation through them at a period when the flow of blood is already languid from general debility. They become soft, of a dull brown, or purplish color, red at the circumference, œdematous, and, at last, black and senseless. The sloughing commences at the point where the pressure is greatest; thence spreads more or less widely, and terminates in the formation of a foul, ill-conditioned, gangrenous ulcer. Some cases present themselves, in which the skin is so extensively destroyed, that, upon the separation of the slough, the sacrum and neighboring bones are denuded, and visible at the bottom of the ulcer, the discharge and irritation from which prove rapidly fatal. Patients sometimes get over severe fevers, bad fractures, &c., and ultimately fall sacrifices to this secondary disease.

With respect to the treatment of this particular case, I need not remind the practitioner, that he should always be apprehensive of this species of sloughing in patients, who are weakened by disease and compelled to lie for several weeks and months in bed. In cases of injury or disease of the spine, of compound fractures of the lower extremity, of fractures of the neck, of the thigh-bone, and in typhoid fevers, such mortification is much disposed to occur. He ought, therefore, to prevent the occurrence by now and then shifting the posture of the sick; and, especially, he should not forget to examine from time to time the state of the parts most subject to attack. On the first appearance of any redness, or discoloration in them, they may be bathed with the liquor plumbi acetatis dilutus, and then covered with a piece of the emplastrum plumbi, or, what is still better, the emplastrum saponis. The posture should at the same time be so altered that the parts affected may not be lain upon. The judicious arrangement of small pillows, or cushions, under particular poinst, will often give the surgeon essential assistance in the accomplishment of this highly important indication; and of late years the hydrostatic bed has been employed with considerable advantage. When sloughing and ulceration have actually taken place, the following applications are in common use: lint dipped in camphorated spirit, or turpentine; carrot or emollient poultices; lint wetted with a solution of opium, or a solution of the chloruret of soda in the camphor mixture or distilled water; and common pledgets. This indetermination concerning what is really the best kind of dressing, sufficiently proves that not much is to be expected from the virtues of local applications. Improving and strengthening the constitution; changing the patient's posture; the use of the hydrostatic bed; and, above all things, the strictest attention to keeping the parts affected clean, and to the avoidance of whatever is irritating to them; are the great leading principles by which the surgeon should be governed.

The circular compression of limbs by tourniquets and tight bandages, if continued too long, will induce mortification. The smaller the extent of the compression, the greater is the risk; and bandages, which operate equally upon every part of a limb, though they may be somewhat tenser, can be borne with greater safety than a narrow band or ligature, which acts only upon a very confined space. Yet, let it not be imagined, that the danger of immoderate, long-continued compression is entirely obviated by equalising the pressure, and increasing the extent of the compressed surface. There are few surgeons, who have not beheld melancholy proofs of the fatal consequences of tight bandages. The greater skill now generally evinced in equalising the pressure upon the whole limb, we must admit, has much diminished the number of these unfortunate examples; but they do still sometimes happen. A surgeon, therefore, should never forget, that, frequently when he is applying a roller, the nature of the disease or injury will necessarily be followed by a great deal of swelling, and for this due allowance should be made in first putting on the bandage. For the same reason, the part should be from time to time carefully examined, and if found to be too much constricted, it should be instantly liberated. Compression is only safe, while it gives no uneasiness; and, when it appears to produce pain, the suspicions of the practitioner ought to be immediately awakened to its dangers. In the practice of surgery, it is sometimes proper to wet bandages with cold water, or particular lotions; but, whenever this is done, the fluid makes the linen shrink so considerably, that, if the change be not guarded against, the constriction produced will often bring on a rapid mortification of the limb, and the death of the patient. Let surgeons also continually bear in mind, that tourniquets are only designed as temporary means of suppressing hemorrhage, and that if their application be long continued, they will surely have the most diastrous consequences. The perils of immoderate circular compression of limbs proceed, not only from the obstruction which it causes in the circulation, both through the arteries and veins, especially the latter, but also from the interruption of the nervous influence and action of the absorbents. It is a remark made by Professor Carswell, that although the physical characters of mortification, produced by a mechanical obstacle to the venous circulation, present considerable variety in different organs, they present one common character, viz. an excessive accumulation of blood in the venous system, trunks, branches, and capillaries of the affected part. There is a great accumulation of serosity in the cellular tissue, which by its pressure further retards the return of blood, and has a chief share in bringing on mortification. It is likewise this accumulation of serosity beneath the skin that at first conceals the congestion of the venous system. Stagnation of the venous circulation may depend on obliteration of veins by pressure, by accidental products formed in their cellular sheath, by the presence of fibrine or other solid substances within the veins, and, lastly, by diseases of the heart greatly interfering with the return of the venous blood.*

With regard to the treatment, the indication in an early stage of the mischief is very simple, viz. to remove the bandage, or tourniquet, and have recourse to fomentations. When the disorder has advanced further, and actually amounts to gangrene, the conduct of the surgeon must be regulated by the extent of the mischief. If it be partial, let him, after removing the compression, foment the parts and vigilantly observe the changes which occur; for it is the nature of this species of mortification often to spread with incredible rapidity, up to the very trunk, and thus in a few hours destroy every possibility of saving either the patient's limb or his life. Whenever there is reason to apprehend that the case will be of this serious description, if amputation be delayed, the operation should be adopted as the only possible means of affording the patient any chance of preservation.

---

* See Dr. Carswell's "Illustrations of the Elementary Forms of Disease," Fasciculus 7.

MORTIFICATION FROM THE DELETERIOUS INFLUENCE OF CERTAIN POISONS.

As illustrations of it, I may mention the mortification of the cellular tissue consequent to the bites of venomous reptiles; the disease called *hospital gangrene;* the *malignant pustule*, and the form of mortification arising from the use of unsound rye as an article of food. The subcutaneous grangrenous mischief, following the bites of snakes, will be described under the head of *poisoned wounds.*

Hospital gangrene is very different from every other form of mortification, not only with respect to its appearance, mode of occurrence, and the peculiarity of its causes, but also with regard to its treatment. It is characterised by its contagious nature, its disposition to attack wounds and ulcers in hospitals crowded with such cases, and by its conversion of the soft parts into a putrid, glutinous or pulpy substance, and not into a firm distinct slough, like what is formed in other species of mortification. On this account, it is sometimes classed with ulcers, and even named the *hospital sore;* and there is really some difficulty in deciding, whether it should be arranged with mortification or with ulcers. Certainly, it has a very strong resemblance to the worst forms of phagedenic ulceration.

True hospital gangrene is undoubtedly communicable by the application of the discharge to an abraded or ulcerated surface in another person. It must, however, have its first origin in some other way, and Dr. Carswell considers it as affording an example of a septic agent being generated in a morbid condition of the solids, and giving rise to a similar disease, when communicated from one individual to another, by means of the dressings, or other direct modes of transmission. Upon an abraded surface, it begins in the form of one or more small vesicles, at the edge of the abrasion. These vesicles are very soon converted into greyish or ash-colored sloughs; or if they happen to contain a dark-colored fluid, and to burst, they put on the appearance of a thin coagulum of a dirty brown color. At the same time, the part becomes acutely painful, and a pulpy slough is rapidly formed over the whole sore. Hence, by Gerson, the disease is actually named *pulpy gangrene.*

When this pulpy substance comes away, the subjacent surface presents a healthy granulating appearance; but, this favorable look is only transient, as the destructive process soon begins again.

When hospital gangrene attacks a wound or ulcer, the part becomes painful, and a viscid light-colored matter exudes from the granulations, which lose their red color, and exhibit spots of a greyish dirty white hue, resembling aphthæ. These spots, all uniting together, completely change the look of the whole wound. The parts have also a much greater disposition to bleed, than what is noticed in any other variety of mortification.

A red purplish œdematous circle is next formed in the surrounding skin. The edges of the ulcer become hardened and averted; and the sloughs, such as they are, put on the appearance of the fœtal brain in a putrid state.

Hospital gangrene spares hardly any textures. Amongst the severe cases, seen by Mr. Blackadder in the military hospitals in Spain, there was one, in which one half of the cranium was denuded, and as black as charcoal. In another, the large arteries and nerves of both thighs were exposed and dissected, the integuments and cellular tissue being entirely removed, with the exception of a narrow strip of skin at the external side of each of the limbs. In other instances, the cavities of large joints were extensively laid open; and, in one man, all the skin and cellular tissue of the neck were completely destroyed. In *the advanced stage*, hemorrhages come on; the bleeding can rarely be stopped by ligatures; no coagulum is produced in the vessels, nor does any healing process take place in them. The pulse is rapid and feeble, and the tongue covered with a brownish or black fur. At an earlier period, the pulse is fuller and not so quick, and the tongue generally white. In many examples, the lymphatic glands are affected with inflammation and swelling.

As for the *prognosis*, this disease is universally admitted to be one of the most dangerous complications to which wounds and ulcers are liable. Slight cases may sometimes be cured, but the more severe ones generally prove fatal, and this, in many instances, by a repetition of attacks.

The exciting cause of hospital gangrene is commonly believed to be *an infection generated in a crowded hospital*, and especially *one filled with wounded persons*. The situation of such hospital on low marshy ground, and the hot season of the year, are generally considered to promote the origin and extension of the disease.

Although the most experienced army surgeons concur in the belief, that hospital gangrene spreads by contagion, little doubt can be entertained, that the number of cases is also increased by the operation of the causes, which give rise to the first examples of it in any particular hospital. Unless we adopt this view, we should not be able to explain the commencement of the disease in the patients first attacked.

In the early stage, bleeding is recommended by some, and condemned by others, who also object to it, on the ground, that there is risk of the puncture becoming itself infected. Bark generally proves unavailing. Emetics have been tried, and, though occasionally spoken of with approbation, they are mostly represented as inferior to purgatives. In every stage of the disease, unattended with diarrhœa, the citric and diluted sulphuric acids have beneficial effects; and, with respect to opium, the agony of the disease is such as always to render its employment in some form or other indispensable. However, on the whole, it may be stated, that no internal remedies can be depended upon for stopping hospital gangrene.

The patient, if possible, should be removed from the hospital, and put into another well ventilated building; and the linen, bedding, and floor sprinkled or washed with a solution of the chloride of lime or soda.

During the last war, the French had a great deal of hospital gangrene in their military establishments, and, at that time, their practice consisted in applying the actual cautery to the parts affected. Now, however, they seem to place great confidence in the solution of the chloride of lime or soda; such confidence, that Lisfranc has expressed a belief, that, by these means, the disorder will be kept in future from committing the kind of ravages formerly observed. The report of the effects of the latter on the disorder, as it occurred amongst the wounded in the French army at the seige of Antwerp, is also favorable.*

Mr. Blackadder recommends liquor arsenicalis, diluted with an equal quantity of water, as an effectual application. He first washes the diseased parts with a solution of the subcarbonate of potass, and then dips lint in the arsenical lotion, and lays it on the parts, the lint being renewed every quarter or half an hour. After the sloughs separate, the surface is dressed with gently stimulating ointments. Mr. Welbank regards gangrenous phagedæna, especially that form of it met with in the wards of hospitals appropriated to syphilitic patients, as the same disease as hospital gangrene. In its treatment, he prefers applying to the parts the undiluted nitrous acid, in the manner to be noticed when we come to the subject of phagedenic ulcers. Delpech speaks very favorably of the effects of hydrochloric as a local application.

MORTIFICATION FROM EATING UNSOUND GRAIN, ESPECIALLY SPURRED RYE.

This, which is one of the worst forms of mortification, and generally attacks the lower extremities, is sometimes accompanied, or preceded by vertigo, drowsiness, and a malignant kind of fever, with a sensation of numbness in the legs, which are painful, slightly swollen, but not inflamed. The skin is cold and livid, and the spacelas commences in the centre of the limb, not at first involving the skin. In a second series of cases, the sphacelated parts are dry livid, or black; these appearances commencing in the toes, and extending gradually upwards as far as the thighs. In a third series of cases, the disease commences with lassitude, and a sensation of insects creeping under the skin, but without any febrile symptoms. Soon afterwards, the extremities become cold, pale, wrinkled, and benumbed, and at last quite insensible and incapable of motion, acute pain being next experienced in the centre of the limb. There is now fever and headache, pain extending from the hands and feet to the shoulders, legs, and thighs; and next the affected parts become dry, shrunk, and black, and drop off at the joints. Entire limbs are thus separated without hemorrhage. Lastly, in other cases, the chief symptoms are at first spasmodic contractions of the limbs, afterwards great mental weakness, voracity of appetite, fatuity, followed by spacelus.* In the treatment, the immediate discontinuance of the deleterious article of food, the support of the constitution by tonics, and suitable deit, and the promotion of the separation of the sphacelated parts, are the chief indications. It is an example of mortification unpreceded by inflammation, and probably taking place, as Professor Carswell suggests, by the operation of the poisonous grain on the parts affected, through the medium of the blood, or nervous system.

---

* H. Larrey, "Hist. Chir. du Siege de la Citadelle d'Anvers," p. 55.

A remarkable instance has lately been recorded of dry gangrene in a child, three years and seven months old, where there was no possibility of ascribing the attack to any particularity in diet. The left leg and both arms were in an advanced state of destruction from dry gangrene. The right forearm had been detached by nature at the elbow-joint; but the slough had extended above the joint, where a second attempt at separation was in progress. The left foot had been entirely detached with the epiphyses just above the ankle-joint, leaving the ends of the tibia and fibula exposed. From the right foot, the phalanges of the second and third toes had been removed.†

The forms of mortification exhibited in malignant pustule, carbuncle, and phlegmonous erysipelas, and those occasioned by exposure of the animal textures to high degrees of heat or to very low temperatures, will be described in subsequent parts of this work.

---

* See Professor Carswell's "Illustrations of the Elementary Forms of Disease," Fasciculus 7.

† S. Solly, in "London Med. Gazette" for June 1839.

OF AMPUTATION FOR MORTIFICATION.

In many accidental injuries, the operation should be performed without any delay, so that mortification may have no time to begin. Numerous gun-shot wounds of the extremities, badly lacerated and contused wounds, and severe compound fractures, will inevitably be followed by gangrene, and the patient's death, if an imprudent attempt be made to save the part. Here amputation should be done immediately after the accident, the wound of the operation being infinitely less hazardous, than an extensive and spreading sphacelus.

As a general rule, it is best to leave the separation of a slough chiefly to nature. There are two exceptions to this maxim: the first is, *when one part of the slough is perfectly loose*, while the rest of it continues attached; under these circumstances, the loose portion should be gently cut away, and removed at once, so as to lessen the fetid effluvia, and allow the healing processes to commence in the situation of the loosened slough. The other exception is, *when the whole thickness of a limb is mortified; but, unless the mortification be traumatic, the line of demarcation must be awaited, as well as a favorable state of the constitution for amputation.* However, even in this case, if the patient lived long enough, nature would complete the separation. The soft parts would first separate down to the bones; the bony connection itself would afterwards be destroyed by a slow process, termed *exfoliation;* and the ulcer finally heal. Yet, leaving the detachment of the whole thickness of a mortified limb to be accomplished by nature is seldom advisable, because the patient would not usually outlive the profuse discharge, the tedious confinement, and the long continued irritation, which he would have to encounter. Then another objection to the plan is, that, if he were to get through these difficulties, and live till the dead portion of the limb had completely separated, and the parts healed, he would remain with an unserviceable stump, one not properly formed, not capable of bearing pressure, and such as would never continue firmly healed.

In mortification, the precise time for the performance of amputation is a consideration of the highest importance. Some years ago, the common rule in surgery was, never to amputate until the progress of the mortification had been stopped, and the red line of separation had been formed. This maxim ought still to be observed in every instance of mortification proceeding from internal or constitutional causes. Here, we have a criterion, by which the question is at once easily settled. We must not amputate in mortifications from internal causes, until the red line of separation is distinctly formed; that is, until the disorder has ceased to spread, and has become bounded by the adhesive inflammation. In truth, sometimes amputation may be advantageously deferred even beyond the period of the first appearance of the line of separation, and of the stoppage of the mortification. Such delay would be proper, if the patient were so reduced at the critical moment in question, as to be likely to die under the operation. Here some little time should be allowed, in order to let the system rally, which it will sometimes do, with the aid of opium, tonic medicines, a moderate quantity of wine, or brandy, light nutritious food, and the admission of plenty of fresh air into the patient's chamber. For the purpose also of lessening the disagreeable effluvia, a solution of the chloride of soda, or lime, may be employed with great advantage. The dead parts should be covered with linen wet with it, and the floor be washed or freely sprinkled with it.

The next thing which I am anxious to explain is, that modern experience does not confirm the propriety of awaiting the formation of the red line of separation, or, in other words, a decided stop of the disorder, in every example of mortification before amputation is practised. The wisdom of the rule is acknowledged in mortifications from *internal causes;* but, if the maxim were extended to some other examples, the patients would certainly go to their doom without having, what may be called, a fair chance of being saved. They would die before the mortification had stopped, or sink into a state, in which the performance of amputation would be altogether hopeless. We are under great obligations to Baren Larrey for many convincing facts and arguments in proof of the necessity of deviating from the ancient rule in what he calls *traumatic gangrene*, or *the mortification arising from gun-shot wounds*, *compound fractures*, *and other forms of external violence.* In such cases, it would generally be absurd to think of waiting for the mortification to stop, or for the appearance of the red line of separation, because the patient would almost always die of the extension of the disease, and its effects upon the whole constitution, before such appearance presented itself—sometimes in the short space of six hours.

Now, it is found, that if amputation be done early, and in a sound part of the limb, sufficiently distant from the sloughing, the stump will, generally, not be seized with mortification, and the patient will have by far the best chance of recovery.

I have recommended this practice to be adopted in several cases, in which I have been consulted ; and, in the army, I had many opportunities of doing the operation myself, under the circumstances which have been described, that is, where the mortification was spreading, and mostly with success. A few years ago, I was consulted by a glazier, who had fallen from a ladder, and met with a compound fracture of the lower end of the humerus, in consequence of which the hand and forearm were seized with a rapidly spreading mortification. In fact, when I was called in, the hand and forearm were in the state of sphacelus, and the cellular tissue of the upper arm was distended with serous fluid up to the shoulder. The patient was at the same time beginning to be affected with stupor and disorder of the intellectual faculties, and his pulse was weak, rapid, and irregular. As there was no time to be lost, the limb was immediately amputated at the shoulder joint. Every thing went on favorably after the operation for five or six weeks—the stump healed, with the exception of a trifling fistulous opening; but, just at this period, when a complete cure was expected, an extensive abscess formed over the scapula, and ultimately proved fatal. However, as this patient would certainly not have lived twenty-four hours from the time of my first visit if the operation had not been done, I deem the case to be one strongly in favor of the rule of amputating in traumatic gangrene, even while the disorder is yet in a spreading state. Some practitioners make one exception to prompt amputation in traumatic gangrene, viz. where it arises in a bad habit of body from a slight mechanical injury. Here, under any treatment, the prognosis must be unfavorable.

Mortification of the foot from injury of the femoral artery by a bullet, or other mechanical means, is another instance in which the old maxim should be abandoned. Here the only chance of saving the patient's life depends upon the early performance of amputation, as high up at least as the wound in the artery.

Mortification from obstruction of the circulation by aneurism, or after the ligature of the artery for the cure of that disease, or *for the stoppage of hemorrhage*, furnish additional exceptions to the rule of not amputating until the line of separation is formed between the dead and living parts. Here the sloughing generally commences at the extremity of the limb. I believe, indeed, that the mortification, following the ligature of an artery for the cure of aneurism, is a case in which, whatever may have been inculcated with regard to other forms of gangrene, the early performance of amputation, at some distance from the dead part, has always been recommended; and the old surgeons themselves never waited until the mortification had actually stopped. Before deciding to amputate, however, we must be sure, that the mortification involves the parts more deeply than the skin; for a partial sloughing of the integuments of the foot after aneurism sometimes takes place, the ulcer heals up, and the limb is preserved.

In the seventeenth volume of the Med. Chir. Trans. I recorded the particulars of an aneurism in the ham, which, in consequence of the sac bursting under the upper part of the gastrocnemius, and the copious effusion of blood in the cellular tissue of the leg, down to the very heel, was followed by mortification. Tying the femoral artery had no effect in checking its progress, so that I was compelled to amputate just on a line with the ligature on the femoral artery five days after the operation for aneurism. Now, although the limb was amputated *while the mortification was spreading rapidly*, a great part of the stump healed by the first intention; and the patient, an organ builder, now living in the Waterloo Road, was soon able, with the assistance of a cork leg, to follow his trade again.

ULCERATION AND ULCERS.

Ulceration is the process by which an *ulcer* or *sore* is produced; an operation, in which the absorbent vessels are usually supposed to be more actively concerned than the arteries.

An *ulcer* or *sore*, previously to the stage in which it is filled up by granulations, is a *chasm* formed on some external or internal surface of the body by the removal of portions of the tissues back into the system, the absorbents appearing as if they had took away the old particles more quickly, than substitutes for them are prepared and deposited by the action of the secerning arteries.*

Morbid absorption of the solid parts, or that which takes place without being accompanied by a correspondent deposit and repair, may extend to the whole machine, every part of which shall become smaller and lighter; or it may be limited in its operation to some particular part, organ, or region. Examples: 1. The wasting of the body in febrile diseases, or of muscles in paralysis, and atrophy of the testicle from various causes. This form of morbid absorption is termed *interstitial*, because it takes place in the interstices of parts, which still remain entire.

2. Another form is that by which the solid parts, covering abscesses, aneurisms, and deep-seated tumors, are thinned and removed. To this Mr. Hunter applied the expression *progressive absorption*, apparently on account of its being the means by which tumors and foreign bodies make progress in any particular direction. The phrase has been criticised, because all absorption is really progressive, and in this objection to it I fully concur.

3. A third modification of morbid absorption is denominated *ulcerative*, in which not only a loss of substance, but a solution of continuity—an ulcer is occasioned. *Ulcerative absorption*, therefore, is only a synonyme of *ulceration*.

Ulceration is a process very different from *erosion*, or from any sort of decomposition, or destruction of parts by chemical agents.

---

* "The term *ulcer* is indiscriminately applied to the vacancy that is caused by absorption, and to the same part, when filled up with granulations, secreting pus, and perhaps daily proceeding to be healed. An ulcer, in the state in which it is commonly seen, is the conjoint product of absorption, and of new growth." (*Macartney*, op. cit. p. 40)

It is not produced by any imaginary corrosive properties of pus or the fluids of the part affected. Healthy pus has no corrosive qualities: indeed, in the early stages of ulceration, and while the ulcerative process is extending with the greatest rapidity, hardly any of this fluid is formed; yet when the pus is abundant, and therefore most likely to produce corrosion, if it had the power, the ulceration has stopped, and the sore is generally healing.

Some writers offer what they call a physiological explanation of the chief phænomena of ulceration; but what they say amounts to nothing more than a statement in different terms of the circumstances I have explained. Thus, when we are told, that nutrition ceases in an ulcerating part, while the destructive action of the absorbent system continues, we are merely informed in other words, that the old particles of the textures attacked by ulceration are taken away by the absorbents, without any effectual attempt to replace them being made by the arterial system.

While ulceration is going on, the secerning arteries, those organs which, in the healthy state, bring and deposit the new materials of every part of the body in proportion as the old are removed, appear to lose this power, and even they, as well as the rest of the organisation, are taken away; nay, after the process of ulceration has begun, the absorbents themselves, which once existed in the situation of the chasm, are no longer there; they have disappeared, and not a vestige of them, nor sometimes perhaps of any other part of the previous structure, remains. It is commonly presumed, therefore, that so long as ulceration is spreading, the unsparing action of these very busy organs, these minute vessels, is accomplishing their own destruction, as well as that of every other constituent part of the textures affected.

There is a limit, beyond which nature will not allow us to pry into her secret and mysterious operations; and our knowledge of the *theory* of ulceration is very confined.

When we express a difficulty in conceiving how a part of the body can be removed by itself, we cannot get that difficulty obviated by our being referred to some other inexplicable, but unquestionable operation or fact, exemplified in the animal economy. Thus, when I am told, that there is not more difficulty in understanding how parts of the body can remove themselves, than in comprehending how they can form themselves, the position may be true, but it leaves me in the same uninformed state, respecting the minutiæ of ulceration, in which I found myself previously to this reference or comparison.

It is even uncertain whether in ulceration the veins may not have a considerable share in the removal of the tissues; for they are known to be enlarged in the immediate vicinity of the seat of ulceration, while the lymphatics themselves are alleged not to be so.

Whatever may be the agents of absorption on this occasion, whether lymphatics, or veins, or both descriptions of vessels, and whatever may be the exact manner in which these vessels are themselves removed in the process of ulceration, we may conclude with John Hunter, that when it becomes necessary that any of the substance of the body should be removed by the actions of the system itself, nature must not only confer new activity on the agents of absorption, but put the tissues about to be absorbed into a state which yields to this operation.

All textures do not ulcerate with equal readiness. It is true, that every organised part of the body seems liable to ulceration; but we see this process much more frequently in the cutaneous and mucous textures than others. The synovial membranes are often the seat of ulceration, as we see exemplified in the process of inflammation of joints, and especially scrofulous diseases of them. Muscles, fasciæ, and the trunks of nerves and blood-vessels resist the ravages of ulceration for a considerable time, far longer than skin, cellular membrane, or mucous tissues. The process of ulceration is rare in serous membranes; and, when it does occur in them, their contiguous surfaces have generally contracted adhesions, through which the ulceration proceeds.* Some of these facts are exemplified in the progress of abscesses to the surface of the body, which do not usually make their way through muscles by causing ulcerative absorption of any portion of them, in order to reach the surface or nearest part of the skin, but often take a very circuitous course, through the cellular tissue, to the point where they present externally.

Ulceration seldom begins originally in muscle, tendon, fascia, a serous texture, blood-vessels, absorbents, or nerves, though, in the progress of disease, all these tissues and organs may be attacked. When a limb mortifies, and the patient continues to live, the ulcerative process, by which the dead parts are detached from the living, gradually extends through all tissues.

Arteries of magnitude, situated in the midst of ulceration, do not readily ulcerate themselves, except in cancer, hospital gangrene, and certain forms of phlagedæna termed gangrenous. Even in the midst of phagedenic ulceration and hospital gangrene, a large artery will often lie a considerable time without giving way, and, when the bleeding commences, it is mostly not from the trunk, but from the branches.

It would seem, from investigations made by Cruveilheir in France, and Mr. Key, in this country, that, in the ulceration of some textures of inferior vascularity, like tendons and cartilages, there is formed previously to the commencement of the ulcerative process, a vascular substance between the fibres of the tendon, or by the synovial membrane immediately in contact with the cartilage, and that such new vascular substance becomes the organ by which such tissues are removed. This view, however, which is not adopted by my friend Sir Benjamin Brodie in relation to diseases of joints, requires further examination. Fasciæ, tendons, and ligaments are the tissues least subject to ulceration.

---

* See Dr. M. Hall's "Principles of Medicine," p. 27.

I have represented an ulcer to be a *chasm a solution of continuity, produced in some internal or external surface of the body produced by absorption*, and have stated that the absorbents, whether lymphatics or veins, appear to be more actively concerned in the formation of such chasm, than *any* other order of vessels.

That the vessels, which are the organs of absorption, are the principal means by which the ulcer is produced, seems to be corroborated by the fact, that, in particular states of the constitution, when old sores break out afresh, the callus, or substance forming the bond of union between the extremities of old fractures, is removed, and the bones, which perhaps have been firmly united for many years, suddenly become flexible, and the fractures are disunited again. Such occurrences were exemplified in the crew of the Centurion, in Lord Anson's memorable voyage.

These facts prove the truth of one of Mr. Hunter's doctrines, viz. that all parts not entering into the original structure of the body are weaker than the rest of our organisation, and, on this account, more prone to ulceration and mortification. A cicatrix is a substitute for the old and original skin, but, it is inferior to it in vital power; and the same is the case with callus, as compared with the primitive osseous texture.

SYMPTOMS OF ULCERATION.

The formation of an ulcer is preceded by more or less pain, heat, redness, a degree of swelling, and other marks of inflammation in the part. The pain is mostly of a sharp pricking or lacinated kind, though it varies in different textures, in the different kinds of disease productive of ulceration, and according as the ulcerative absorption is quick or slow. In numerous instances, the cuticle is loosened, and a little vesicle or pustule is formed, and on its bursting a breach is discovered in the subjacent surface of the skin. Sometimes there is at first a single minute excavation; sometimes several ulcerated points contiguous to one another, which quickly joining together, make a sore of some magnitude. On a mucous membrane, ulceration often begins with small, round ash-colored solutions of continuity, as familiarly exemplified in the mouth and fauces.

The existence of inflammation as an attendant on ulceration is proved not merely by the circumstances already specified, but by the regular closure of the canals of the large blood-vessels, as the particles of the tissues attacked are taken away. At all events, it is the modern doctrine, that such closure is effected by means of the adhesive inflammation.

While no attempt at reparation is made, ulceration always presents an excavation or chasm, the edges of which are red, sharp, and often jagged and irregular. The surface of the exposed textures is of a dirty white or yellowish color, with an appearance of shreds upon it, as if every atom of the parts destroyed had not been completely removed. The surface is also generally covered with a thin discharge, or a kind of sanies, or thin matter frequently tinged with blood.

While ulceration is extending itself, the margin of the adjoining skin is hot, red, and painful; but directly a disposition to heal commences, this state ceases. If not checked, ulceration may extend to any depth, and affect any textures. In many instances, the ulcerative process appears to be diffused over a considerable extent of surface; and in others again, it is limited to a very narrow line, producing a chink or fissure, an appearance similar to that which occurs in the separation of mortified parts.

The progress of ulceration is extremely various in different textures, and in the same texture in different individuals, according to the nature of the inflammation, and no doubt also according to the particular constitution of the person in whom it occurs. In some instances, it is exceedingly slow or chronic in its progress, the sores which it forms remaining for a long while open, without any disposition to spread. In other cases, ulceration advances with great rapidity, removing or destroying considerable portions of the body in a few hours.

ULCERS.

If we restrict the definition of an ulcer, or sore, to a chasm or breach in the solids, occasioned by the process of ulceration, we then have no difficulty in determining what cases should be classed as ulcers; but certain cases are frequently termed ulcers, which are not formed in this manner. Thus, when a suppurating and granulating surface is the consequence of a wound, that has continued for a long while unhealed, there may be the appearance of a cavity from the simple retraction and separation of the parts; but none of their substance may have been truly removed, either by the accident itself, or by any subsequent action of the absorbent system; yet it is not uncommon to give the name of *ulcer* to a case of this kind, which was originally a wound.

In mortification, both *acute* and *chronic*, the sloughs are loosened by a process similar to common ulceration, by what Dr. John Thomson has proposed to call *disjunctive absorption*. In these instances, therefore, the surface, exposed by the detachment of the slough, will certainly come within the definition of an *ulcer*.

The same must be the case with the *solution of continuity, resulting from every abscess that bursts of itself*, because, after the skin has been thinned to a certain extent by progressive absorption, ulcerative absorption takes place. If *suppurating wounds, after a certain duration*, are to exchange their name for that of *ulcers*, then one common definition of an ulcer will not be applicable; viz. *a solution of continuity in the solids, accompanied with loss of substance, and a discharge of purulent matter.* Nor would Callisen's definition answer, "a solution of *continuity gradually produced in organised parts.*" But, if the term ulcer be restricted to the effects of the process of ulceration, then, of course, *loss of substance*, and the *gradual manner* in which the chasm is produced, are very good criterions. With this understanding, Callisen's definition is the best that I know of.

With respect to the causes of *ulcers*, the most frequent are *inflammation* and *abscesses*, which have burst; the *separation of sloughs; pressure on parts in a state of inflammation*, as is too often exemplified in the effects of chains on prisoners, of harness on horses, of badly predded splints on broken limbs; and of the long continuance of patients with fractures, fevers, paralytic affections, and other tedious diseases, in the recumbent position. Ulcers are also produced by many kinds and forms of *external irritation*. In the lower extremities, a frequent cause of ulcers is *a varicous state of the veins*. The production of sores is frequently the consequence of *diseases, which begin in the bones, cartilages, or synovial membranes* of the joints, the ulcers in the soft parts being then generally preceded by abscesses. In some diseases of the joints, ulceration of the cartilages is one of the primary, or earliest changes.

But, ulcers frequently arise from *constitutional diseases*, several of which are of a *specific* nature, as is illustrated in scrofula, lues venerea, scurvy, cancer, and fungus hæmatodes. Hence, one of the best and most practical divisions of ulcers, is into *local* and *constitutional;* but, true and natural as it is, it should be adopted with a clear understanding, that many sores, which at first depend entirely upon internal causes, and are in the beginning of a *specific* nature, are often so materially changed, long before cicatrization is completed, that, in their latter stages, they are strictly *local* complaints.

On the other hand, many sores, which are at their commencement only of a *local* nature, and quite unconnected with internal causes, are afterwards changed, or influenced by some general affection of the system, and become in every sense of the expression *constitutional ulcers.*

Ulcers continually vary in their nature and appearance with every fluctuation in the constitution or change of health. Directly a patient, who has a healthy ulcer on his leg, or some other part of his body, secreting a due quantity of good pus from small granulations, of a florid vermilion color, such as are seen in the best conditioned sores, is attacked by fever, a rapid change is noticed in the aspect of the sore, it will immediately become pale, and cease to pour out any other discharge, than a small quantity of thin ichor. Its surface then becomes dry, its granulation slough, or are absorbed, and the healing process is completely stopped.

The state of ulcers likewise materially depends on the treatment of them. Thus, by improper dressings, excesses in diet, and too much disturbance of the part, an indolent sore may be converted into a very painful and irritable one.

The *prognosis* generally depends, first, upon the *nature of the predisposing and exciting causes*, and the facility or difficulty of their removal; secondly, upon the *kinds of parts attacked*, whether of great importance or not in the animal economy; thirdly, *upon the patient's age*, *constitution*, *and mode of life;* fourthly, upon the *extent of the ulcer;* fifthly, *upon its peculiar nature:* thus a venereal sore may generally be healed with facility, because one medicine is well known to exert considerable power over the venereal disease; but, a scrofulous ulcer is commonly much more difficult of cure, because we are in possession of no remedy so decidedly efficacious in scrofula as mercury is in the venereal disease. We know of nothing that will at once rectify that state of the system, with which a scrofulous sore is intimately connected. As for a cancerous sore, I believe, that it can never be cured, without some process, or operation, that has the effect of destroying, or extirpating the cancerous tissue. With this understanding, then, it would not be correct, to assert, that such a sore is absolutely incurable. I have known the whole of a breast, affected with carcinomatous ulceration, to be destroyed by sloughing, and the part afterwards heal. There was living very lately in Great Ormond Yard, Queen Square, a woman, above eighty, who had had cancer in both breasts, which, when I saw her, had entirely sloughed away, and healed up, leaving only some induration, and a prodigiously disfigured cicatrix.

Ulcers on the trunk, or near the source of the circulation, generally heal in less time than others farther from the heart, or on the limbs; and every surgeon is well aware, that sores on the arms commonly heal with much greater expedition than such as occur on the legs. The depending position of the legs retards the return of the venous blood, checks the freedom of the circulation, and thus has a disadvantageous effect on the healing processes.

The process, by which ulcers heal, is precisely the same as that which brings about the cure of suppurating wounds. It includes the important subjects of *granulation* and *cicatrization*, which will be noticed when the treatment of such wounds as cannot be healed by the first intention come under consideration. Therefore, I shall merely observe at present, that when ulceration is checked, and the preternatural activity of the absorbents of the part is reduced, the capillary secerning arteries regain their power, and by their means a process of reparation is begun, by which the cavity of the sore—the chasm produced by the absorbents—is filled up with granulations, and the surrounding old skin gradually drawn a considerable way over the part originally occupied by the ulcer, so that, comparatively speaking, little new skin is required, which is rather difficult of formation, and never so strong and serviceable as the old.

In the *treatment of ulcers*, the chief indications are *to remove and diminish the causes which have given rise to their formation;* and to let the patient have the advantage of a *suitable diet* and *regimen*, particularly of *rest*, and a judicious *position* of the part, *pure air*, *cleanliness*, and such *internal medicines* and *dressings* as the circumstances of the case may demand.

With respect to *the removal of the exciting cause*, the necessity for it is so manifest as scarcely to need any comment. Supposing an ulcer were to originate from and be kept up by the presence of a dead portion of bone directly under it, how could we expect it to heal the sore so long as such piece of bone continued in the part? If a sore were to arise from scurvy, it would be in vain to attempt its cure, without removing that peculiar derangement of the health with which the local complaint is intimately connected. I have mentioned the effect of scurvy in causing the absorption of the substance composing a cicatrix, and of the uniting medium of fractures termed *callus*. How then can we be surprised at our inability to heal sores, while this disordered condition of the whole animal economy remains unrectified? In order to give some idea of the universal derangement of the system resulting from scurvy in an aggravated form, I may here refer to preparations in the Museum of University College, London, demonstrating that, in advanced stages of this disease, the muscular system is affected in a very singular manner, blood exuding from the vessels, and becoming copiously deposited between the muscular fibres.

Scrofula and syphilis, as exciting causes of ulcers, require the same principle to be acted upon, and so does a stricture in the urethra, as the cause of ulcers and fistulæ in perinæo.

Some other sores, if they are not produced, are certainly kept from healing, by *disturbance of the digestive functions*, the regulation and improvement of which then become essential indications.

However, I am far from meaning to assert, that every sore requires, as a matter of course, the exhibition of medicines; many sores will heal under the use of simple dressings without a single dose of physic being given. In all cases where the sore is healing well, and the constitution sound, the utmost that the surgeon is called upon to do with medicines is to regulate the patient's bowels.

But *constitutional ulcers*, and especially those which are *specific*, *irritable*, *phagedenic*, or in any other way *ill-conditioned*, may often be more benefited by general than by local treatment. In the management of every description of ulcers, one grand object is *to keep the surrounding skin clean*, and not to let the discharge accumulate and dry upon it. Were this rule neglected, the skin would become irritated, and it will always be found, that when any inflammation is excited in the integuments at the circumference of an ulcer, it not only interrupts the healing process at the edges of the sore, but is likely to be followed by a renewal and extension of the ulceration.

All ulcers may be arranged under three classes: *healthy* and *unhealthy*, amongst which last are those termed *specific*. The first, or *healthy* ulcer, can only be of one kind—the *simple sore*, the simple purulent *ulcer* as it is sometimes termed—characterised by its freedom from all diseased action, and its disposition to heal up in the most favorable manner.

The *second*, or *unhealthy class of ulcers*, comprises *irritable*, *indolent*, and *phagedonic* ulcers; those connected with *varicous veins*; many other depending upon *disorder of the digestive functions*, and various difinitive or indefinitive derangements of the health.

The *third class*, or *specific*, comprehends *scrofulous*, *cancerous*, *venereal*, *scorbutic*, &c. Many ulcers, proceeding from cutaneous diseases, are specific. We need not here dwell upon the absurdity and confusion of assigning the importance of distinct species of ulcers to those, which happen to be attended merely by accidental changes, or complications, to which all sores, without exception, are liable. Thus *fistulous* and *sinuous ulcer*, *inflamed ulcer*, *carious ulcer*, *sloughing ulcer*, and *fungous ulcer*, are expressions occasionally made use of to denote distinct species of sores, whereas they ought, at most, only to signify certain states or complications incidentally conjoined with an ulcer, and which may occasionally attend any kind of sore whatsoever.

Simple or *healthy ulcers* are known by the small size, florid color, firm consistence, and pointed shape of their granulations, which resemble minute cones, and are less disposed, than some other kinds of granulations, to rise higher than the level of the surrounding skin. The pus secreted by them is white and thick, and not adherent to their surface. When they have risen to the level of the neighboring skin, those at the margin of the ulcer become smooth and covered with a thin bluish semi-transparent film, which soon turns opaque, being converted into the new skin, which is quickly covered by cuticle. Such is a healthy ulcer, or one in which the process of cure is going on favorably in a person of sound undisturbed constitution. The florid red, or vermilion color of the granulations, denotes a free and vigorous circulation in them. Their color is not, however, precisely the same in every position of the limb; for when the part is kept in the depending posture, the florid redness frequently changes to a deeper, or purple color, in consequence of the retardation of the venous circulation. Under these circumstances, as Mr. Hunter conceived, the blood in the minute arteries probably assumes also the dark color of that which fills the veins.

The *treatment* is simple, because the well-directed operations of nature ought not to be too much interfered with. The surrounding skin should be kept clean; and soft lint having been applied to absorb the redundant matter, it may be covered with a pledget of any mild unirritating ointment, like those of spermaceti, marsh-mallows, or calamine. In this manner the evaporation of the thin fluid part of the pus, and the production of a scab will be prevented. The lint ought never to be laid over the edges of the ulcer, where the fine bluish pellicle lies. One important part of the process of cicatrization is the extension of the old skin over a considerable portion of the surface previously occupied by the sore. Now this process would be much retarded if the granulations, especially those near the edges of the ulcer, were suffered to become too high. It may therefore become necessary to repress them by touching them now and then with the nitrate of silver. In doing this, the main skill consists in not applying it completely to the edge, so as to disturb the semi-transparent film, or beginning of the new skin, but only just so far towards it as the high appearance of the granulations may require. Some practitioners use the sulphate of copper for this purpose; but it is very inferior in its effects to the nitrate of silver, which I join Delpech in thinking the best of all escharotics for sores, because it appears to possess the greatest power of expediting the contraction and absorption of the granulations, or the change established in them for the purpose of making the old skin more effectually cover a considerable portion of the ulcer.

The healing of sores on the lower extremity, even of those which rank as similar ones, is seriously impeded by the patient's walking about, and keeping the limb in the perpendicular position. The effect, which the latter circumstance has in lessening the florid color of the granulations, I have already explained. Now when the patient will not confine himself in the recumbent posture, or refrain from taking exercise, it will generally be found advisable to afford as steady a support to the limb as can be obtained from the application of a roller, or laced stocking. In this manner, the weight of the column of blood in the large veins is in a great measure prevented from retarding the circulation, and the part is placed in a state of comparative rest. A bandage is also useful on another principle; it keeps the granulations from rising up too much, and thus renders the use of caustic less necessary. It also maintains a briskness and vigor in the healing process. However, if a bandage is to do any good, it must be applied skilfully, and with particular attention to let the pressure act evenly and moderately upon the whole surface of the limb, and not partially.

In University College Hospital, simple ulcers are seldom dressed with ointment, but covered with the *water dressing*. A piece of fine soft lint is wetted with cold or tepid water, laid over the ulcer, and covered with oiled silk, to prevent evaporation. Dr. Macartney, who has taken an active part in advocating this method, employs two, three, or four layers of lint, and dispenses with a bandage. If the sore require gentle stimulation, a weak solution of sulphate of zinc or copper may be employed, in the same way, instead of simple water; and, if a stronger application become necessary, the best is the nitrate of silver.

When the patient cannot avoid walking about, simple ulcers may be cured by encircling the limb in the situation of the sores, and for a little way above and below them, with long strips of adhesive plaster, which should be long enough to reach all round the limb, and have two or three inches to spare at each end. The middle of each strip is to be applied to the side of the limb most remote from the sore, and the two ends are then to be brought completely across it, one overlapping the other.

Another class of ulcers comprises those named *irritable*. A sore will always partake of the nature of the constitution, and, if this should be what is termed an *irritable* one, the sore will generally be more or less *irritable*. It will also be irritable, in various impaired states of the halth, in persons who may not naturally have what is called an irritable temperament. In this point of view, I think, there is decidedly a difference between an *irritable* and an *inflamed* ulcer.

These remarks receive some confirmation from a fact mentioned by Sir Everard Home, namely, that an irritable ulcer cannot always be known at once by its mere appearance, and its character is sometimes not manifested till the surgeon ventures to use some slightly stimulating application, or to make pressure. This would be explained, however, by some practical surgeons in another way, viz. by their view of an irritable sore being always attended with weakness and over-action. Yet, an irritable sore is frequently marked by particular appearances. Thus the margin of the surrounding skin is often jagged, sharp, and, as it were, undermined. Concavities of different sizes are seen at the bottom of the ulcer, without any distinct formation of granulations. The discharge is mostly thin and bloody, the disease attended with excessive pain, and a remarkable tendency to hemorrhage, when its surface is lightly touched with a probe. In many instances, some of the ulcerated surface is covered with a dirty ash-colored slough, on the separation of which new grangulations arise, but are soon absorbed again, or they slough directly after their formation.

It seems as if local circumstances had influence in making an ulcer irritable; for, sores of this character are often met with in the skin covering the lower end of the fibula, or in the integuments situated over the shin, or the ligament of the patella.

In the treatment, complete quietude of the part, and the employment of soothing applications, leeches, and aperients, are generally proper at first. Bathing the part in a warm decoction of poppy heads, exposing it to steam, and covering it with a warm soft bread poultice made with the lotion of the acetate of lead, or with water to which a little of an aqueous solution of opium or hyosciamus has been added, are very beneficial plans. Dressing the ulcer with lint wetted with tepid water, and covered with a piece of oiled silk to prevent the lint from becoming dry, will sometimes agree with the sore better than any thing else. In private practice, I have lately had several cases, with which no mode of treatment agreed, excepting that now referred to. However, no success will attend this, or any other practice, unless care be taken to keep the limb in an elevated posture, and in a state of perfect repose.

Sometimes dressing an irritable ulcer with lint dipped in a solution of opium (five grains to an ounce of water) or of the extract of hyosciamus, answers well; but a still better application, after a time, is found in many instances to be a lotion containing from two to five drops of nitric acid to one ounce of distilled water, with or without a proportion of opium in it. The black wash or lotion, consisting of ten grains or a scruple of calomel to one ounce of lime water, is sometimes employed. The pressure of a bandage is inavariably pernicious.

When the surrounding skin is red, swelled, and painful, and the patient full of blood, general and topical bleeding are indicated; but the sore is then rather an inflamed than merely an irritable one; or partakes of both characters.

When the irritability of an ulcer seems to be connected with disorder of the digestive functions, the blue pill or calomel with light tonics and aperients may be prescribed; or the compound infusion of gentian with the sulphate of soda, the liquor potass, or carbonate of soda, and leeches to the epigastrium, according to circumstances.

In the generality of irritable sores, it is necessary to keep the patient more or less under the influence of opium, or the preparations of morphia or hyosciamus. Costiveness must always be obviated, and, when much debility is present, the sulphate of quinine, or the infusion of cascarilla with diluted sulphuric acid, will often prove valuable medicines.

Indolent ulcers constitute at least three-fourths of the sores for which surgical assistance is required, and are principally met with upon the lower extremities. The edges of the skin, encompassing such an ulcer, are generally thick, prominent, and rounded. The granulations are pale, smooth, large, and flabby, with a peculiar gloss or semi-transparency about them. They secrete an imperfect thin kind of pus, blended with flakes of coagulating lymph, which adhere more or less to the surface of the ulcer. The pale color of the granulations denotes a want of briskness and vigor in their circulation. Indeed, such is the indolence of some of these ulcers, that granulations are not formed at all; but the bottom of the sores represents a pale brown flat surface, and the disease looks as if a portion of the skin had been taken away, and no attempt at reparation made. For a considerable distance round the ulcer, the parts are swollen and indurated: sometimes indeed the whole of the leg is enlarged and œdematous; yet the swelling is not soft and yielding like common œdema, but firm and incompressible. In nine out of ten cases, indolent ulcers form on the leg, and the nearer they are to the ankle, the more difficult they are to cure. The patient is also generally above the middle age. In the majority of cases, the pain is so trifling, that the patient is scarcely conscious of having a sore at all.

The mode of dressing an ulcer may communicate this indolent character to it; thus, when fomentations, emollient poultices, or lint wetted with tepid water, and covered with oiled silk, are continued too long, the granulations become large, pale, and flabby, and the healing will not proceed. But, if we could succeed in healing the sore with such applications, and with the work of such granulations, the cicatrix would be too weak to remain sound a long time; and the part would soon break out again into a fresh sore. On the other hand, if we take care to stimulate these weak granulations by means of suitable dressings, they undergo considerable improvement in their nature, becoming smaller, more compact, redder, and free from their former gloss or semi-transparency, and the cicatrix will be likely to prove lasting and serviceable.

With respect to *applications to indolent ulcers*, the following are in common use: a solution of the nitrate of silver in the proportion of five or ten grains to an ounce of distilled water; the application of the nitrate of silver in substance; the diluted nitrous acid; the ointment of the nitrate of quicksilver, mixed with an equal quantity of spermaceti ointment; the compound tincture of benzion; the yellow basilicon ointment, with one drachm of red precipitate to each ounce of it.

When the surface of a chronic ulcer is foul, the discharge thin and offensive, the chloruret of soda in a poultice, or lotion, will often produce vast improvement. The strength of the application should be regulated; but, from three to six parts of distilled water to one of the concentrated solution sold in the shops, will suffice for ordinary use. When a lotion is used, lint should be dipped in it, put on the ulcer, and covered either with a common pledget, or piece of oiled silk, to prevent evaporation.

Perhaps, however, nothing is more useful in the treatment of indolent ulcers than well-regulated pressure, made with a common roller, a stocking bandage, or strips of adhesive plaster, put on in Baynton's manner. Pieces of soft linen are to be then laid over the part, and the whole leg evenly covered with a calico roller. If the discharge be not very profuse, the plaster need not be changed oftener than every other day. In summer, or when the parts are disposed to inflame, we cut the plasters at the point opposite the sore, and keep the bandage and plasters wet with cold spring water. Under this treatment, the swelling of the limb subsides, the callous edges are levelled, the surface of the ulcer granulates, assumes a healthier color, begins to form good pus, and to heal up. When common adhesive plaster is found to be too irritating to the skin, we may employ either the emplastrum plumbi, or the brown soap plaster and ordinary adhesive plaster blended together in equal quantities. We should be careful, however, not to extend this practice to irritable ulcers.

Mr. Higginbottom treats indolent sores in the following way: he keeps the patient in bed twenty-four hours, and puts a poultice on the part; he then applies the nitrate of silver, not merely to the ulcer, but to the surrounding skin; afterwards covering the sore with strips of adhesive plaster, and a bandage.

When the ulcer is on the foot or lower part of the leg the strips of plaster may be applied as follows: they are to be fifteen inches long and two wide; the foot being placed at a right angle with the leg, one of the strips is applied from the first bone of the great toe, along the inner edge of the foot, round the os calcis, to the first bone of the little toe; the middle of another strip is placed under the heel, and its ends carried perpendicularly up over each side of the leg; the circular and perpendicular strips are then continued alternately, and thus the foot and ankle are entirely covered, the strips having a very neat appearance, and not only making the requisite pressure, but keeping the ankle perfectly quiet.

Phagedenic ulcers literally mean any sores which eat away the parts, as it were, and truly their appearance conveys such an idea. Their surface, which has a yellowish, or livid appearance, is so irregular, that one might suppose it had been really produced in the manner referred to. The matter secreted is only in small quantity, generally adherent to the surface of the sore, and not unfrequently tinged with blood.

Phagedenic ulcers are frequently met with in syphilitic cases, but they occur also under many other circumstances. Thus, *crancrum oris*, as it is termed, is a true specimen of phagedenic ulceration of the mucous membrane of the lips and cheeks; and the gangrenous affection of the pudenda in children, described by Mr. K. Wood, is another variety of the same disease. We may also observe that, though scrofula generally produces sores of an indolent character, it sometimes gives rise to phagedenic ulceration of a very troublesome and inveterate description. But, when phagedæna takes place in syphilis or scrofula, it is an accidental complication, and not any essential part of those specific complaints.

Phagedenic ulceration in its worst forms, as arising in syphilitic cases, or perhaps, as we should rather say, those seen in the foul wards of hospitals, and produced by the bad atmosphere of such places, the noxious effect of mercury itself, and a constitution impaired by excesses, bears a considerable resemblance to hospital gangrene. It begins from some minute point of ulceration or abrasion, or as a small boil surrounded by a halo of dusky red inflammation. It is often met with in the lowest class of filthy gin-drinking prostitutes; and one variety of it is well known at St. Thomas's and Guy's hospitals under the name of the *Swan Alley sore*, in consequence of the many young girls, who come from that notorious place, being afflicted with it. Its most common situations are the cleft of the nates, the groin, or the upper part of the thigh. I have seen it occupy the arm from the shoulder to the elbow, so as to expose the brachial artery in the greater part of its track; but much more frequently in the groin, where, and in the thigh, its ravages were such as to lay bare the femoral artery. The disease is attended with severe darting pain, which is at first remittent, but afterwards incessant. The exposed surface is covered with a straw-colored flocculent substance, and a viscid secretion. The surrounding edges are thickened, abrupt, frequently everted, and always connected with a mass of swollen reddened integuments.

Hemorrhage soon occurs, and, returning from time to time, contributes seriously to the reduction of the patient's strength. The fetidness of the discharge is such, that no person can enter the ward without being conscious of its peculiarity. A man of experience recognises it almost as a proof of the nature of the disease. At length, the sore having become deep, a copious quantity of foul matter, and shreds of a pulpy substance, are taken away every time the dressings are changed.

The disease is often terrific, on account of the rapidity of its progress. Its commencement is sometimes attended with little febrile disturbance, but, in its advanced stages, the general indisposition is as alarming as it was at first slight. The patient is sleepless from constant agony, the appetite lost, the tongue covered with a white or brownish fur, the epigastrium tender, together with severe headache, an accelerated pulse, a sallow skin, and, when the disease spreads with great rapidity, bilious vomiting, or diarrhœa. Delirium is rare.

Disease of this description sometimes attacks several patients in the same ward, hospital, or district. Hence it is occasionally supposed to be of the same nature as hospital gangrene, and to be, like it, contagious. It is some corroboration of this opinion to remember, that here, as well as in hospital gangrene, local remedies are at least as important as constitutional ones. In the commencement of phagedæna, bleeding will sometimes relieve the pain, and have other good effects, yet on account of the natural tendency of this disease to hemorrhage, venesection should not be carried to any great extent. Local bleeding is not approved of, however, because the leech-bites sometimes assume the same morbid action, just as is seen in hospital gangrene. It does not appear that bark, quinine, or the diluted acids, have any specific power over the disorder, though, in the stages of debility, they may be prescribed, while there is no diarrhœa. They should also be given with port wine, and a nutritious but light diet. Opium, and especially the muriate or acetate of morphia, are the best internal medicinces, and the patient should be kept constantly under their influence, with due attention to the regulation of the bowels.

Mr. Welbank, who drew up an excellent history of gangrenous phagedæna, found the application of the undiluted nitric acid to the surface of the disease the surest means of stopping it ravages. The surrounding skin is first to be protected by a thick coating of cerate. Lint is then to be dipped in the acid, and pressed on the part. The surface, having thus been converted into a firm and dry mass, is next to be covered with simple dressings, and an evaporating lotion. If any other sloughs form after the separation of the first, the use of the nitric acid is to be repeated.

In France, a solution of the chloruret or chloride of sodium is much employed as an application to phagedenic sores. The strength is one part of the concentrated solution to eight or ten of distilled water. The fluid may be blended with a poultice, or lint may be dipped in it.

Many phagedenic diseases arise from the patient's being in a bad atmosphere, and the best medicines and applications will be of little use, unless the patient be removed from the pernicious influence of the unwholesome air and effluvia to which he is exposed.

Pure air, free ventillation, cleanliness, fumigating the room or ward, sprinkling it with the chloride of sodium or lime, are all proper measures in the treatment of phagedenic ulcers. We are to employ purgatives and venesection, when there is inflammation, &c.; and when great debility is present, bark, quinine, the diluted sulphuric or nitrous acid, with a light nutritious diet, and wine. As for dressings, carrot poultices, bread poultices, a watery solution of opium or hyosciamus, the liq. opii sedativus, with a pledget, or poultice over lint; a bread poultice made up with a solution of the chloride of soda; the nitrous acid lotion, or the black or yellowish wash, may be tried. In bad cases, amounting to gangrenous phagedæna, it is sometimes necessary to apply the liquor arsen. diluted, or the concentrated nitric acid itself.

Dupuytren's powder, composed of four parts of arsenical acid and ninety-six submuriate of mercury, has proved efficacious in curing certain phagedenic ulcerations about the face; but it must never be put on any ulcerated surface to an extent beyond what a shilling would cover.

Ulcers connected with varicous veins are peculiar to the lower extremities, and mostly occur either on the inside of the leg, near the ankle, or on the instep. A varicous state of the veins seems to produce vast disorder in the capillary circulation, and a tendency to chronic inflammation in the skin of the leg, often denoted by brown dusky discolorations of the integuments, terminating the formation of an ulcer. The edges of the sore are generally indurated, raised, and callous, while its color and that of the neighboring skin are brownish or livid. The pain is considerable, but often more felt in the neighborhood of the sore, and in the course of the principal veins, than in the sore itself.

In the early stage of varicous ulcers, while inflammation is present, leeches and simple dressings, with evaporating lotions, purgative medicines, quietude in bed, and low diet, are the best means of relief. Sometimes, however, fomentations answer better than cold evaporating lotions; and frequently the best application to the ulcer at first is lint wetted with tepid water, and covered with oiled silk.

Afterwards, one of the principal indications is to take off the weight of the column of blood in the diseased veins, or to obliterate all direct communication between those veins and the venous branches returning from the parts about the ulcer. Hence, the practice of taking up the trunk of the vena saphena as it passes behind the knee joint; an operation now very properly abandoned, on account of the dangerous consequences frequently arising from the tying of large veins; namely, those resulting from *phlebetis*.

Instead of this method, Sir Benjamin Brodie suggested another, which consisted in passing a narrow convex-edged bistoury under the vein, with the flat side of the blade at first turned towards the vessel, and simply dividing it, without cutting the skin over it. There are some other practitioners who attack varicous veins with caustic, applying it so as to bring on a degree of inflammation in the dilated vein, near the part of the skin on which it is put, just sufficient to produce an effusion of fibrine within the vessels, and its subsequent obliteration. But, a better plan is that of passing a long steel pin under each of the veins which it is wished to obliterate, and then applying some thread, or silk, in the manner of the twisted suture. The pin should be withdrawn on the third day, and not be left to make its way out by ulceration. Except in cases attended with remarkable obstinacy and severity, the patient should be content with a well applied bandage, laced stocking, or the stocking roller, with dressings adapted to the particular condition in which the ulcer and surrounding skin may happen to be.* If inflamed, we should defer the bandage, but keep the patient in bed, use leeches, simple dressings, and evaporating lotions, or poultices, and fomentations, always keeping the limb strictly quiet in the recumbent position, or rather with the foot and leg raised above the level of the thigh. When the sore is foul, we may employ poultices, or dress it with a solution of the chloruret of sodium. When the inflammation has subsided, we may have recourse to equable pressure, applied from the toes to the knee, with any dressing or application which the appearance of the granulations may require.

---

* Some additional remarks on this subject will be found in the section on "Diseases of the Veins."

With regard to specific ulcers, those produced by scrofula, the venereal disease, fungus hæmatodes, chimney sweeper's cancer, common cancer, &c. will be considered in future parts of this volume.

Sir Everard Home has described, as a specific ulcer, a sore that sometimes occurs on the instep, or foot, attended with enormous thickening of the integuments, something like that of elephantiasis. The disease is met with in persons who have lived freely. The application, said by him to agree best with this kind of sore, is the ointment of the nitrate of quicksilver, with a proportion of camphor in it. He also describes a *fungated ulcer* of the calf of the leg and sole, which he represents as curable by the internal and external use of arsenic, unless attended by disease of the lymphatic glands, when he always found it incurable. A case, corresponding to the latter, was under my care in University College Hospital in the year 1835, and the parts are preserved in the museum of the college. The disease, which implicated also the inguinal and lumbar glands, presented a combination of medullary with scirrhous cancer.

Hitherto the observations, delivered in this work, have chiefly related to common inflammation, and its occasional consequences; but other kinds of inflammation and their effects remain to be considered, without some knowledge of which we should not be able to acquire even an elementary proficiency in surgery. The species of inflammation, which will next be noticed, are *erysipelas*, *diffuse inflammation of the cellular tissue*, and the *inflammation accompanying boils*, *carbuncles*, and the *malignant pustule*. All these varieties are characterised by peculiarities not seen in common inflammation, nor in the inflammation directly resulting from certain specific diseases, as syphilis, scrofula, and cancer.

ERYSIPELAS.

A peculiar inflammation of the skin, characterized in its simple and genuine form by the bright red color of the part affected; by a propensity to spread with remarkable rapidity; by a diffused, not a circumscribed, swelling of the skin and cellular tissue under it; and an indisposition in the morbid action to be speedily checked by the establishment of that process, which Mr. Hunter called the adhesive inflammation.

To define it merely as an inflammation of the skin, would not, however, be correct, because in one of its forms it affects the subcutaneous cellular tissue even in a greater degree than the skin Besides, in many instances, the disorder is in reality a fever, beginning with constitutional disturbance, which is followed by this peculiar inflammation of parts of the surface of the body.

In popular language, the disorder is known under the name of *St. Anthony's Fire;* and when the skin presents a light red hue, tinged with yellow, it is sometimes called the *rose.*

No inflammation, except that of mumps, gout, or rheumatism, is so subject to change its place suddenly as erysipelas. Neither is there any inflammation in which the sudden resolution of inflammation, to which the French pathologists apply the term delitescence, is so frequently and so dangerously exemplified.

Of all cases of erysipelas, that of the head and face is most liable to delitescence, preceded or followed by inflammation of the brain or its membranes, and coma or delirium. If any parts suppurate, they are generally eyelids. The disorder may arise, not only from fever, but local injuries—especially wounds, pricks, or contusions of the scalp. The skin of the face and head, indeed, are particularly liable to erysipelas from very slight injuries.

Erysipelas is generally defined to be a peculiar inflammation of the skin, characterised by a propensity to extend with great rapidity, though one form of it certainly affects the cellular tissue in a greater degree than the cutis, and, according to Baron Dupuytren, really commences in it. John Hunter believed that erysipelas, when viewed as an inflammation, marked by a great propensity to spread over an extensive surface, denoted the existence of a peculiar state of the constitution, without which the patient would have experienced from any local irritation, not erysipelas, but common inflammation. He also thought that the seat of erysipelas was not necessarily restricted to the cutaneous texture, but that when that peculiar state of the constitution prevailed to which I have alluded, all inflammation, wheresoever situated, might partake of an erysipelatous character, and have a tendency to spread in a greater degree, and with more rapidity, than ordinary inflammation. But, although practitioners occasionally speak of erysipelatous sore throat, and erysipelatous inflammation of the conjunctiva, and although the extension of erysipelas from the face to the interior of the mouth, the nassal fossæ, the pharynx, and even the cavity of the tympanum, is a fact recorded by Dupuytren and others*, the view entertained by Hunter on this point, is far from being generally entertained. Perhaps, the mere circumstance of an inflammation having a remarkably great disposition to spread,—to run along a surface, as it were,—is not an unequivocal proof of its character partaking of an erysipelatous nature connected with peculiarity of constitution, because sometimes the kind of texture affected communicates to the inflammation that kind of disposition, as is well illustrated in the inflammation of every serous membrane.

---

* Dr. Macartney, I observe, recognises mucous membrane as a texture liable to erysipelas Op. cit. p. 137.

When the skin is merely affected with redness, is not perceptibly swelled, has no vesications upon it, and is of its usual softness, the case is termed *erythema*, which may or may not be the first degree of erysipelas, according to the general state of the system, on which the latter essentially depends. When the slight redness of the skin, called erythema, is produced in a healthy subject from any stimulation of that texture, by friction, heat, &c. it cannot be regarded, according to the foregoing doctrines, as a stage or degree of erysipelas.

Erysipelas is divided into *simple*, or *superficial*, *phlegmonous*, and *œdematous*.

Some distinctions, occasionally specified, do not imply any peculiar varieties of the disorder, and in this respect are superfluous: thus *malignant*, or *gangrenous erysipelas*, is only a stage of phlegmonous erysipelas, *erysipelas erraticum* is merely a term applied to the disease when it continues to spread from one part of the skin to another, to an unusual extent, and for a longer period than common, thus visiting sometimes nearly the whole surface of the trunk, limbs, &c. in succession.

In *simple* or *superficial erysipelas*, the skin is of a bright red color, smooth, and shining, the redness being in general more or less bounded by a definite line, and not gradually fading away at the circumference of the part affected, like the redness of phlegmonous inflammation. When the part is pressed upon with the end of the finger, the redness disappears in the place which has been touched, leaving a white spot visible for a short time, but which is quickly obliterated again by the return of the red color. In simple erysipelas, the circulation is not impeded, and hence the pressure of the finger on the skin removes the red color, which immediately returns when the pressure is discontinued. The same fact accounts also for the bright red color, the arterial blood being readily transmitted into the capillary veins. Probably, as Dr. M. Hall observes, it is by the stagnation of the blood in the capillaries, that common inflammation differs from mere blushing, from eruptions, and, in some degree from erysipelas.[*] There is no throbbing like what attends phlegmonous inflammation; and, if the skin alone be affected, hardly any perceptible swelling, and no tension. Still, when the finger is passed along the part, a trivial degree of stiffness, and a different feel from that of the rest of the skin, are manifest. Except in slight cases, however, there is always some fluid effused in the cellular tissue, and consequently a softish swelling. The inflamed part is hot and painful, the sensation at first experienced by the patient being that of an itching or pricking, but this soon becomes a burning kind of pain, and, when the parts are handled, extremely acute. The disease is frequently, but not always, attended with vesications, a thin serous fluid being effused under the cuticle, and raising it into small vesicles, or large *bullæ* or blebs, like those produced by a blister. Generally they contain a yellowish fluid, but sometimes a gelatinous substance, and now and then a bloody liquid, or pus. At length they burst, and incrustations, or scabs, are formed, which, in a few days, fall off, leaving the skin under them mostly sound, but occasionally eroded by superficial ulcerations.

---

[*] Principles of Medicine, p. 17.

Simple erysipelas most commonly terminates in resolution, with desquamation, or a peeling off of the cuticle, though, if the disorder be slight, there may be no desquamation at all. When the inflammation is more severe at some points than others, limited suppurations in the cellular tissue may take place; but these only happen where the inflammation extends more deeply than usual, and affects the cellular tissue in certain situations with greater severity than in others. It is the nature of simple erysipelas to extend rapidly, and hence it will frequently pass over a large portion of the surface of the body in a short time. Another feature of the complaint is, its disposition to get well on one side, while it is spreading in another direction. Hence it frequently presents itself in all its different stages in one and the same person at the same period. In one place, that which was first attacked, there is perhaps desquamation; in the part last invaded, there is redness and swelling; at other points vesications; in other situations again, incrustations, or scabs; and, in a few places, if the disease has been severe, possibly a degree of suppuration. As the inflammation declines, the redness fades, the part then frequently exhibiting a yellowish tinge. One striking difference between phlegmonous and erysipelatous inflammation is, that the former is circumscribed, whereas the latter has no precise limit; for though the redness is terminated by a more or less abrupt line, the swelling from the effusion of serum in the cellular tissue is diffused, without any definite boundary. In fact, erysipelas is attended with little or no adhesive inflammation around it, and hence, partly, its uncircumscribed character, and the extensive disorganization of the cellular tissue, when suppuration takes place in the worst, or phlegmonous variety of the disease. Simple erysipelas is attended with restlessness, acceleration of the pulse, headache, thirst, dryness of the skin, and other febrile symptoms. The most dangerous example of it is that which attacks the head and face, preceded by shiverings, headache, loss of appetite, and perhaps vomiting, and afterwards accompanied not only by a frequent pulse and most of the common symptoms of fever, but often by a lethargic drowsiness, or a tendency to coma, or delirium. When the latter symptom comes on early, the disorder it frequently fatal. The indisposition does not subside on the breaking out of the cutaneous redness on the second or third day, but continues till the local inflammation itself abates, which generally happens, under successful treatment, about the tenth or eleventh day, followed by copious evacuations from the skin and kidneys. If any parts suppurate, they are usually the eyelids, the cellular texture of which is abundant and loose. When erysipelas attacks the face, the swelling of the eyelids, and indeed of every part of the countenance, is such as to prevent the patient from being recognised by his most intimate acquaintance; the disfigurement is indeed prodigious. The loose cellular tissue of the eyelids is vastly distended, and, as it were, œdematous; the eyes are closed and watery; the nose swollen; the nostrils dry; the lips puffed up; the ears red and shining; the saliva often flows out in profusion; and the mouth is opened with difficulty. Erysipelas, in all its forms, is a species of inflammation, the blood being cupped and buffy.

Phlegmonous erysipelas differs from simple erysipelas in the higher degree and deeper extent of the inflammation, which not only affects the skin and cellular tissue, but has a tendency, when severe, and especially when situated in the lower extremities, to produce in the latter texture suppuration and extensive gangrenous mischief. The skin itself, being more highly organised, resists the effects of the disease longer, and when it does slough, does not perish to the same extent as the cellular tissue. Baron Dupuytren believes, that phlenmonous erysipelas does not affect the skin originally, but the cellular tissue, the cutaneous texture being attacked secondarily. This observation is true at all events, I believe, with reference to that modification of phlegmonous erysipelas described by Drs. Duncan, Scott, and others, under the name of *diffuse inflammation of the cellular membrane*. A few years ago, it was a common notion, that phlegmonous erysipelas sometimes began in the fasciæ; but this is never the case. Although, in severe instances, the fasciæ may be destroyed, they are attacked subsequently to the skin and cellular tissue, and, in many *post mortem* examinations, they are found not to be at all involved.

In phlegmonous erysipelas, the skin becomes more raised, and the swelling harder, deeper, and of a darker color, than in simple erysipelas. At first, indeed, the part may be of a pale rose tint, with a smooth shining appearance of the skin; but, after a little while, the redness becomes darker, sometimes assuming a browish or deep, almost a livid tinge. In many instances, the discoloration is irregular, the skin exhibiting a mottled or marbled appearance. At first a sensation of pricking and heat is experienced, which soon changes into a severe burning pain, and the swelling becomes such that the limb is frequently of twice its natural thickness. In the beginning, the swelling yields to the pressure of the finger, or pits, in consequence of the copious effusion of serous fluid in the cellular tissue, but afterwards the part becomes so firm, that if pressure be made on it, no pitting is occasioned, because the cellular tissue has now become hardened and thickened. In phlegmonous erysipelas, the white spot, caused in the part when it is pressed with the end of the finger, is not so quickly obliterated again as in simple erysipelas, neither does the skin rise up so promptly to its former level, after it has been made to pit.

As the disease advances, vesicles generally form, varying in size from that of a pin's head to that of a bean, and very often they are still larger. Their contents, which are at first a clear serum, frequently assume in a little while the appearance of a purulent fluid, or of a reddish or turbid serosity. If the case proceed favorably, the vesicles burst, incrustation takes place, and the case ends in the separation of the scabs, and desquamation. If the disease attain a more severe degree, the subcutaneous cellular tissue sloughs, and, often about the fifth or sixth day, the skin itself assumes a purple color, loses its sensibility, softens, and becomes covered with phlyctenæ. There is now some sloughing of the skin, but a great deal more of the subjacent cellular tissue, in which purulent matter is extensively diffused. In fortunate cases, the sloughs separate, the gangrenous cellular tissue comes out, and the ulcers heal; but more frequently, and especially without the aid of surgery, the patient falls a victim to the constitutional disturbance.

The supparative stage is not attended with additional swelling, elevation, and pointing, as in the suppuration that arises from common inflammation, but rather with a diminution of tension, a feel of softness and a trivial subsidence of the part. Hence, when the disease has arrived at this stage, it may appear for three or four days as if it were stationary, or even inclined to recede; and an inexperienced surgeon may be induced to defer the only measure likely to prevent gangrenous mischief.

In severe forms of phlegnomous erysipelas, there is always an extensive separation of the skin from the subjacent fascia, and of the muscles from one another; often attended with the formation of numerous sinuses and sloughing of the fasciæ and tendons themselves. In very bad cases, inflammation, ulceration, or even gangrene of the synovial membranes, the formation of matter in the joints, ulceration of cartilages, and sometimes caries and necrosis, are the effects of this alarming disease. The constitutional disturbance is often exceedingly severe. In the early stages of the disorder, the pulse is frequent, strong, and full; afterwards it increases in number, but its strength and fulness decline. The urinary and other secretions are suppressed, the alvine evacuations stopped, the patient has no sleep, there is excessive agitation of the nervous system, and frequently delirium. In the suppurative and gangrenous stage, the tongue becomes brown or sometimes black; at first it is moist, but afterwards dry, with great foulness of the gums and teeth, and fetor of the breath. The pulse is very quick (140) and small, and it is not uncommon for it to be irregular. If the disease assume a still more aggravated form, a bilious vomiting, or a diarrhœa, with involuntary discharge of very fetid dark-colored matter from the bowels may ensue, followed by coma or delirium, subsultus tendinum, and death.

In many cases, arising from local injuries, the febrile disturbance at first closely resembles common inflammatory fever; but afterwards, if the disease lead to suppuration and gangrene of the cellular tissue, or threaten those consequences, the pulse becomes very quick, weak, and even irregular, with great derangement of the nervous system, and imminent danger. In many instances, the fatal termination is preceded by inflammation of the pleura, peritonæum, or mucous membrane of the bowels, or lungs.

Too often, when the patient recovers, after long and profuse discharge, and the slow detachment of numerous deep-seated sloughs of cellular tissue and other textures, the structure of the limb is so impaired, and the skin, fascia, muscles, tendons, and bones, all so agglutinated together by irregular adhesions, that the functions of the part are permanently injured.

Phlegmonous erysipelas is sometimes the consequence of fever, but more frequently of accidental injuries, especially of punctured or contused wounds, compound fractures, burns, neglected or irritable ulcers, the bites of venomous snakes, or punctures and cuts received in dissection. Sometimes it follows the prick of the lancet in venesection; and Dupuytren enters a caution against confounding phlegmonous erysipelas from venesection with phlebitis; for sometimes it is accompanied by inflammation of the vein, and sometimes not. Phlegmonous erysipelas is often attended with inflammation of the absorbent glands, and with streaks of painful thickened inflamed lymphatics running up to them, as is frequently exemplified in phlegmonous erysipelas of the leg and forearm. The two affections, however, are very distinct, and not essentially connected with one another. Phlegmonous erysipelas of the legs has a greater tendency to terminate in suppuration and a gangrenous destruction of the sub-cutaneous cellular tissue, than the same disease in most other parts of the body. There the cellular tissue of the limb suppurates as readily as that of the eyelids or the scrotum, and the pus is not collected in one cavity, but diffused. The cellular tissue indeed is soon converted into extensive sloughs, several inches in length. Then the skin, thinned and deprived of its due supply of blood, turns of a livid color and also sloughs, more from defect of nutrition than from inflammation. This consecutive mortification of the skin is remarkably common in the lower extremity, especially the leg, where the nutrient arteries, the anterior and posterior tribial, and the peronæal are very deeply placed, and only communicate with the cutaneous texture by small ramifications, almost all of which are involved in the destruction affecting the cellular tissue. On the contrary, phlegmonous erysipelas of the head rarely brings on sloughing of the scalp or skin, because here the arrangement of the arteries is very different; the temporal, frontal, and occipital branches being situated directly under the skin, between it and the aponeurosis of the occipito-frontalis, so that when the cellular tissue under the latter part becomes gangrenous, the supply of blood to the scalp is little interfered with; the integuments do not mortify; and if the pericranium escape destruction, and the membranes of the brain remain unaffected, the patient often survives. Depuytren never saw but one instance of sloughing of the skin in phlegmonous erysipelas of the head.

Œdematous erysipelas. Nothing is more common than to observe œdema of the subcutaneous cellular tissue in the latter stages of simple erysipelas, and in the first stages of phlegnomous erysipelas. It is indeed a constant attendant on erysipelas of the eyelids and scrotum. But, by the term *œdematous erysipelas* is particularly implied the case, in which the swelling of the skin and subcutaneous cellular tissue comes on slowly and progressively, communicating the feeling of œdema, instead of the firm resistance of phlegmonous erysipelas. The skin which is smooth and glossy, *pits* when pressed upon, and the hollow thus produced is very slowly affected. Vesicles on the skin are less common in this, than the other varieties of erysipelas. If they occur at all, it is usually between the third and fifth day; they are small, and on breaking are followed by thin diminutive incrustations. The labia pudendi, the scrotum, the legs of dropsical persons, on which scarifications have been practised, are frequently the seats of œdematous erysipelas,often followed by sloughing of the integuments, a feeble, quick, irregular pulse, vomiting, typhoid symptoms, low delirium, and death. Œdematous erysipelas is of a yellowish brown or dark red color. It occurs chiefly in the parts specified, or, if in others, only in broken anasarcous constitution.

With respect to the *causes of erysipelas*, why should any local irritation produce in one person this form of inflammation, and in another person common inflammation? Certainly, the fact is difficult of explanation, unless we admit the existence of some peculiar condition of the constitution, as a predisposing cause of the disease. Erysipelas is sometimes prevalent in particular seasons of the year, and states of the atmosphere, and occasionally endemic in certain districts and hospitals, where temporary or local circumstances may be presumed to be excercising a pernicious influence on the system. Intemperance and errors of diet appear to be frequently concerned in giving a tendency to erysipelas. Dr. Wells's doctrine of erysipelas being now and then contagious, is one not settled even at the present time. Fever, cold, and various accidental injuries, and local irritations, are the usual exciting causes of erysipelas, where the predisposition to it exists. It is not simple inflammation of the skin.

Simple erysipelas, not of great extent, and unattended with coma or delirium, generally has a favorable termination in about ten days. I have attended worse cases, which lasted six or eight weeks, leaving after their termination a tendency to inflammatory affections of the mucous membrane of the bowels or lungs, or to the formation of large boils, and very fetid abscesses in various parts of the body. One young woman, whom I attended, died soon after a severe attack of erysipelas, in consequence of a large and suddenly formed abscess of the hip.

Erysipelas of the head, phlegmonous erysipelas of the leg, or affecting the armpit and breast, and œdematous erysipelas in a broken or dropsical constitution, are the most dangerous examples of the disease.

Mild cases of *simple erysipelas* yield to saline purgative medicines, diaphoretics, and low diet. Dissolve one ounce of sulphate of magnesia in five and a half ounces of mint water, and add to the mixture half an ounce of antimonial wine. Two table spoonfuls of this may be given every four hours; or five grains of blue pill, or three of the submuriate of mercury, may be administered every night, or every other night, or calomel with James's powder, followed by a solution of sulphate of magnesia in the common saline or effervescing saline mixture, which should be repeated at intervals.

More severe cases require venesection, and the free application of leeches. This practice is particularly necessary where the patient is young and plethoric, the pulse strong, hard, and frequent, and, in all cases, where the head is the seat of the disease.

When simple erysipelas is accompanied by uneasiness about the stomach, a foul tongue, headache, and fetid breath, an emetic, followed up by a brisk calomel purgative, should be given. The old doctrine of erysipelas being essentially dependent on debility is now much on the decline. This is fortunate, because it led to the neglect of depletion in the early stage, the period offering the best opportunity of keeping down the disease. The idea also, respecting the specific power of bark, over erysipelas, influences but few practitioners of the present day; bark, the sulphate of quinine, sulphuric acid, and other tonics being only useful after the disease has been checked by bleeding and other antiphlogistic measures. After this has been done, indeed, not only bark and quinine, but cordials, wine, ammonia, and a light nutritious diet, may become highly beneficial. Ventilation and cleanliness are of vast importance in all stages of erysipelas.

When the disorder suddenly recedes, and internal organs are attacked with inflammation, the part originally affected should be immediately covered with a blister. When erysipelas is spreading up a limb, or from the chest or arm towards the neck, its extension in such direction has sometimes been effectually prevented by making a black line on the skin with nitrate of silver, a little beyond the part affected. With regard to local applications, fomenting the inflamed surface with decoction of poppy heads, or simple warm water, or moistening it lightly with a feather dipped in mucilage of quince seeds, are plans frequently adopted. When simple erysipelas arises from a wound, or other local injury, cold evaporating lotions are the best in the early stage of the disorder. Powdered starch, flour, chalk, or calamine, applied fos the purpose of absorbing the fluid discharged from the vesicles, is not so frequently used at the present day as formally. The application of mercurial ointment is sometimes commended, as having a specific power in stopping erysipelas; Professor Gibson speaks very highly of the plan*; but, in this metropolis, it does not retain many advocates. Rubbing the nitrate of silver on the inflamed skin, and beyond it, or blackening the part with a strong solution of the same caustic, I believe, with Dr. Macartney, to be more useful than either mercurial ointment, or blisters; though not to be trusted for the relief of phlegmonous erysipelas in a severe form.

In *phlegmonous erysipelas* more rigorous antiphlogistic treatment is necessary than in simple erysipelas, and especially general and local bleeding, and the administration of calomel, followed by saline purgatives and tartarised antimony. In the very beginning, cold evaporating lotions often prove more effectual than warm applications; I have found this to be the case, and Dupuytren's experience is in favor of the practice. We are to persist in depletion, and to employ cold and warm applications so long as there is any chance of resolution. But immediately it is manifest that, notwithstanding our utmost exertions, the cellular tissue is becoming more and more gorged with fluid, and that suppuration and gangrene of that texture would be likely to follow the continuance of such treatment, then the indication requiring prompt attention, is to make a sufficient number of punctures or incisions, so as to discharge from the cellular tissue the great quantity of fluid which distends it, and has a principal share in bringing on mortification of it.

When matter has formed, or sloughs have occurred, all surgeons have long concurred in the necessity of making free incisions; but, in an earlier stage, where fomentations, or cold sedative lotions, applied freely and constantly, and rigorous antiphlogistic means, fail to check the disease, punctures or incisions are now universally acknowledged to be the most likely means of preventing gangrene of the cellular tissue, by discharging the serous fluid with which it is gorged. For this improvement we are indebted to Mr. Copland Hutchison.

---

* Institutes and Practice of Surgery, vol. i. p. 41. ed. 5.

The poultices or dressings are to be often changed, and the discharge carefully sponged away. Out of the openings we are to remove all loose portions of disorganised cellular tissue, but to avoid pulling them away before they are loose.

The lodgment of matter is to be carefully prevented by incisions, and its re-accumulation by compresses and a bandage, as soon as the parts are quiet enough to bear them. After a time, indeed, bandages become of great service for removing the œdema and swelling.

Baron Dupuytren, in his mode of dressing abscesses and ulcers occasioned by phlegmonous erysipelas, takes particular care not to let the dressings confine the matter. After the discontinuance of the poultices, he puts slips of old linen, spread with a mild astringent ointment over the edges of the ulcers, and then lays over their centre a piece of soft old linen, which has numerous apertures cut in it, and spread with the same ointment. In order to expedite the healing, we may occasionally employ a weak solution of nitrate of silver.

The tedious length of time which some of these cases occupy, the protracted irritation, the profuse discharge, the number and extent of textures injured, must be productive of dangerous degrees of weakness and hectic fever. Hence tonics, wine, pure air, and light nourishing articles of food, are frequently of great importance in enabling the constitution to continue the struggle. But, sometimes nothing will give a chance of saving life but amputation.

With respect to erysipelas of the scalp resisting venesection, leeches, tartarised antimony, calomel, and other means of depletion, surgeons have been many years in the habit of treating it by making a crucial incision through the skin, cellular tissue, and aponeurosis of the occipito frontalis, so as to free the parts from tension. In twenty-four hours, the patient is frequently relieved by such treatment, and the delirium and other bad symptoms stopped.

Whenever erysipelas seems connected with gastro-intestinal inflammation, leeches may be applied to the epigastrium.

In the *treatment of œdematous erysipelas*, the constitution will not bear loss of blood. Here aperient and tonic medicines, and sometimes iodine, may be prescribed with advantage. The part may be fomented with decoction of camomile flowers, to which may be added a proportion of camphorated spirit. If sloughing occur, we are to use poultices. In this form of erysipelas, the parts will not bear incisions without risk of gangreme. The quantity of fluid, however, sometimes renders punctures indispensable, but they should be small, and made with the fine point of a lancet. In the decline of the disease, a bandage is of great service.

Diffuse inflammation of the cellular texture differs from phlegmonous erysipelas in the cutaneous inflammation itself being absent or trivial. The skin, instead of being hot, as in phlegmonous erysipelas, is colder than natural. In some cases, the inflammation runs its course, and terminates in extensive suppuration and sloughing, without any redness; and, in all true cases, the inflammation of the skin, when it does occur, is secondary.

The disease arises from external injury, sometimes from punctures received in opening bodies, sometimes from the bites of venomous reptiles, and frequently from fever. It often occupies the cellular tissue of a whole limb, and proves fatal. In the cases related by Dr. Duncan, when the cause of the disease had been applied to any part of the hand or arm, the seat of the secondary inflammation was chiefly in the axilla, extending towards the sternum, up the neck and down the side, as far as the os ilium; and, in Professor Dease's case, even to the thigh of the affected side. The disorder sometimes shifts its place from one side of the body to the other. It is mostly accompanied with excessive constitutional irritation, fever of a typhoid character, extreme muscular debility, and mental depression.

In the *treatment of diffuse inflammation of the cellular tissue*, the plan will depend upon the nature of the exciting cause. Thus, the bites of venemous reptiles, and of wounds received in dissection, may require constitutional remedies not called for in other cases. For the most part, leeches and cold applications are to be preferred in the early stage, but afterwards fomentations. Blisters are beneficial by producing a copious discharge of serum; but, when much fluid is effused in the cellular tissue, the best practice is to make free incisions for its discharge. Notwithstanding the affection of the skin be only secondary, and that of the cellular tissue primary, I see in this disorder a great resemblance to phlegmonous erysipelas, of which, perhaps, it may be only a variety.

FURUNCULAR, CARBUNCULAR, AND OTHER GANGRENOUS FORMS OF INFLAMMATION.

1. ***Furuncular inflammation*** is exemplified in the complaints called ***boils*** and ***styes***. If the investigations of Baron Dupuytren have been conducted with accuracy, there are conical elongations of the subcutaneous cellular tissue extending into the texture of the cutis,

as coverings of the vessels and nerves proceeding to its surface. Now, it is alleged, that it is the inflammation of one of these elongations of the cellular tissue which constitutes a boil, just as a simultaneous and confluent inflammation of several of these processes of cellular tissue takes place in carbuncle. Of course, it is not meant that the inflammation is confined to the cellular tissue; for, the skin always participates in it. Whether the foregoing statements be true or not, a boil may be described as a circumscribed, prominent, hard, very painful tumor, of a conical shape, with a portion of dead cellular tissue in it, its apex being above the level of the surrounding skin, and its base below it. Its color is a dusky red, often inclining to purple. Between the fourth and eighth day, the apex turns white, softens, and bursts, giving issue to a small quantity of thin bloody matter, and at the bottom of the little opening a part of the mortified cellular tissue, termed the core, is perceptible. The generality of boils do not become larger than a marble or walnut, though some few attain the size of a pigeon's egg.

The conical prominent shape of a boil exposes it very much to friction of the clothes and external injury; and considerable pain and annoyance are common consequences of such a tumor. Between the tenth and twelfth day, the *core* becomes loose, and, on its evacuation, a cylindrical gaping cavity left, reaching from the apex to the base of the swelling. After this the pain ceases, the skin gradually resumes its proper level, and the cavity granulates and heals.

Boils are most frequent in children and young plethoric individuals. They are also common after acute febrile diseases, typhus, measles, small-pox, attacks of erysipelas preceded by fever, and in persons who drink ardent spirits.

Although Dr. Macartney believes, that if the water-dressing be resorted to in the beginning, boils will seldom exceed the size of peas, and produce no pain; and although certain experiments made by Dumeril and Bretonneau, and the observations of Mr. Higginbottom, on the use of nitrate of silver, prove, that boils may sometimes be completely stopped and repressed by touching them slightly with caustic at their very commencement, the ordinary pratice is to cover them with warm emollient applications. The cure having formed and become loose, its evacuation is the chief indications. For this purpose, the boil, when sufficiently mature, should be opened. Should the patient be very timid, and the boil only small, it may be covered with a piece of adhesive plaster, which will expedite the ulceration of its apex, and promote the discharge of the little mass of disorganized cellular tissue. Few boils are severe enough to require local bleeding; but, if a boil occur in the perinæum, between the scrotum and anus, it may bring on a difficulty of expelling the urine. Here, or wherever a boil causes inflammation of the lymphatic glands, or is of a large size, or there is more than one such tumor, antiphlogistic treatment should not be neglected. In particular, when boils follow one another for a long time in succession, a course of aperient and alternative medicines is indicated. After a boil has been opened, a poultice may be applied for a day or two, and then stimulating dressings.

ANTHRAX OR CARBUNCLE.

The term *anthrax* is sometimes not used synonymously with *carbuncle*, or what the French call *charbon*, which Dupuytren, Rayer, and others, restrict to a gangrenous swelling that occurs as a symptom of the plague. This is often named the *pestilential carbuncle*, in order to denote its difference from anthrax, or common carbuncle.

Anthrax or *carbuncle*, is a broad, flat, distinctly circumscribed, hard, painful, inflammatory swelling, of a dark red, livid, or dull brown color, beginning in the subcutaneous cellular tissue, a considerable mass of which is in a mortified state, while a bloody sanious matter occupies the interior and base of the swelling. A carbuncle differs from a boil in the greater flatness of its surface, the more violent nature of the inflammation, the deeper and more extensive sloughing under the skin, the greater breadth of the disease at its base, the more severe character of the constitutional disturbance, and the kind of individuals in whom the disease presents itself. It differs also from a boil in its greater size, in its being almost always a single solitary tumor, which at length bursts, not by one small opening, like that on the summit of a boil, but frequently by several apertures, which give the skin a sievelike appearance. Like a boil, however, the common carbuncle generally occurs on parts of the body where the skin is thickest, and where the cells of the cellular tissue are most fully developed, as in the nape of the neck, over or between the scapulæ, on the back, the sides of the chest, or about the nates. I have seen several instances of carbuncle on the occiput, and although the disease is rare on the limbs, John Hunter mentions having seen it so placed. When it occurs on a limb, the thigh is the part mostly affected. I had a patient in University College Hospital, who had a large carbuncle on the left side of the neck. While boils are never larger than a pigeon's egg, carbuncles sometimes attain the diameter of a common dinner-plate; and they may become of this size in the course of a week or ten days. A carbuncle begins as a little swelling, not more than a few lines in breadth, with some resemblance, in this stage of it, to a boil, but sometimes presenting upon its centre a little vesicle filled with bloody serosity. Occasionally, however, a larger surface is affected in the very beginning. In proportion as a carbuncle increases in size, it becomes more prominent, but extends in a still greater degree in depth. At every point the swelling retains a singular degree of hardness, a hardness often compared to that of brawn, until the cellular tissue begins to slough; then its circumference continues hard, and its base to spread, while its centre presents an obscure fluctuation. The deep purple color of the skin does not disappear under pressure; and the sensation of heat, which is from the first of a burning kind, only diminishes after one or several apertures have been formed. The disease is also well known to be attended with a sense of stiffness, tension, and weight in the part. If the disease be suffered to go on, the skin, after assuming a deep purple, or dull brown red color, becomes thinned and softened, and at length bursts at one or more points, from which flows a bloody discharge, mixed with whitish flakes of mortified cellular tissue. Then additional perforations of the skin follow, out of which may be extracted a white core, or gangrenous mass, all at once or piecemeal. The mortified cellular tissues in carbuncles is never black, like an ordinary slough. The smell of the discharge is exceedingly fetid, yet peculiar; quite different from that of putrid animal matter. The white flakes of cellular tissue, and the whiteness of all the sloughs, which come away with the matter, explain the reason of Sir Astley Cooper's statement that the matter of carbuncles generally looks like a mixture of flour and water.

If nature herself prove adequate to the discharge of the mortified cellular tissue, she is only capable of doing so slowly, and by an ulcerative destruction of the skin, whereby all the sloughy cellular tissue is by degrees voided, and a very deep ulcer left, at the bottom of which one may sometimes see the fascia, the tendons, the muscles, and in some instances even the denuded cervical vertebræ.

Carbuncles are chiefly seen in persons above the middle age, whose constitutions are broken and impaired. Hence the disturbance of the general health, accompanying the disease, is mostly severe, and not unfrequently the issue fatal. Intense headache, considerable disorder of the stomach, great anxiety, and despondence, are usual symptoms; and in the progress of the disease in its severe forms, rigors, clammy sweats, bilious vomiting, or diarrhœa, palpitations, faintings, extreme prostration of strength, white tongue, followed by a dry brown appearance of that organ, typhoid symptoms, coma, delirium, and death too often follow.

Carbuncles sometimes lead to plebitatis, and thus their fatal termination is accelerated, as I have had occasion to see.

With respect to the *prognosis*, if, together with a carbuncle of large size, there be great prostration of the vital power, a small, rapid, and irregular pulse, frequent vomiting, and a tendency to coma or delirium, the danger is urgent. The same is the case if matter form in the joints or other organs, as effects of the complication with phlebitis.

A carbuncln on the head or neck, *cæteris paribus*, is more perilous than in other situations.

As for the *treatment*, at the very commencement of the disease, leeches and other antiphlogistic means may be useful, in proportion to the strength of the patient and the intensity of the inflammation. In this country, the applications, mostly preferred at first, are fomentations and poultices; but, in France, sometimes cold lotions. The best means of stopping both the local and the constitutional disorder is to make one or two free incisions, in the form of a cross, and carried deep enough to pass completely through the dead cellular tissue. Some of this may now be pressed out, and if a poultice of oatmeal and port wine, or the fermenting cataplasm be used, the rest will soon follow piecemeal, leaving a deep ulcer, which, as soon as the sloughs have come out, should be dressed with a moderately stimulating ointment or a solution of the nitrate of silver. The ung. resinæ flavæ with red precipitate or turpentine, or peruvian balsam, is also a dressing in great repute. Antiphlogistic measures can never be long continued. The prostration of strength, and the typhoid character of the constitutional disturbance, quickly call for a change of treatment. Then tonics become necessary, especially the Peruvian bark, the sulphate of quinine, sulphuric acid, together with opium or the muriate or acetate of morphia, to procure rest, and medicines for the regulation of the bowels.

In some parts of the continent, and also in the United States, the plan of destroying a portion of the skin over a carbuncle, with the potassa fusa, as soon as openings form in the tumor, is not uncommonly adopted.*

MALIGNANT PUSTULE.

There are at least four diseases communicable from animals to man, viz. cow-pox, hydrophobia, glanders, and malignant pustule. This last, with the pestilential carbuncle, is treated of by Rayer under the head of gangrenous inflammations.

The malignant pustule is a contagious and gangrenous inflammation of the skin and cellular tissue, exhibiting on its surface, in the earliest stage of it, a vesicle not larger than a millet-seed, filled with a bloody serous fluid, under which is a small induration, that soon becomes surrounded by a redness like that of a flea-bite (*puce maligne*). The indurated point is next attacked with gangrene, which spreads rapidly from the central point towards the circumference, producing extensive and fatal ravages.

In cases tending to a fatal termination, the pulse soon becomes small and concentrated, with extreme restlessness, frequent syncopes, dry brown tongue, cadaverous countenance, dryness of the skin, dull glassy look of the cornea, great despondency, pain about the præcordia, and low delirium, the forerunner of death.

---

* Physic, in Philadelphia Journ. of the Med. and Physical Sciences, vol. ii. p. 172.

The malignant pustule, instead of proceeding from internal causes, like carbuncle, usually arises from an external one, namely the direct application of a specific contagion to the skin, produced in horned cattle, which labor under or die of epidemic gangrenous diseases. Hence the disorder is rarely seen except in butchers, slaughtermen, shepherds, tanners, &c. It scarcely ever occurs in this country, and seldom at Paris; though it is not uncommon in Burgundy and some other parts of the South of France, and in Italy.

Bayle and Rayer are authorities in favor of the possibility of its occasional sporadic commencement in the human subject, a circumstance not generally admitted. The eating of the flesh of cattle, killed when affected with epidemic gangrenous diseases, is described by Larrey and others as an exciting cause. Whether the disease can be communicated from one human being to another is an unsettled point. Chelius believes, that such transmission has never been proved.*

In the *treatment*, deep incisions, and the application of the most powerful caustics, as the liquid muriate of antimony, or caustic potassa, are recommended. Even the excision of the pustule, while it is small, has sometimes been performed, and repeated when the gangrenous mischief did not stop, followed by dressings of stimulating ointments or lotions, caustic applications, or even the actual cautery. Tonics and stimulants, bark, sulphate of quinine, the diluted sulphuric acid, wine, æther, ammonia, opium, with aperients, and, if the stomach be much oppressed, an emetic; are the best internal means. Antiphlogistic measures are universally disapproved of by those surgeons, who have had opportunities of seeing this form of disease.

OF CHEMICAL AND MECHANICAL INJURIES.

The former comprise *burns* and *scalds*, and certain *ill consequences arising from the exposure of the body*, or *parts of it*, *to very low temperatures*. The latter comprehend *wounds*, *fractures*, *dislocations*, *sprains*, and *contusions*.

---

* Handbuch der Chirurgie, b. i. p. 22. Leipzig, 1826.

BURNS AND SCALDS.

A *burn* is the effect of the action of concentrated heat upon the living tissues; an injury combining in its nature inflammation, a lesion of textures, and sometimes disorganisation of them. A moderate degree of radiating heat thickens the cuticle, hardens the skin, blunts its sensibility, and imparts to it a more or less deep brown color. Such are its effects upon persons, who are habitually exposed ot the solar rays, or to the heat radiating from powerful fires. Blacksmiths with their rough horny palms and fingers can touch and hold with impunity pieces of iron which are nearly red-hot.

A greater degree of radiated heat produces irregular marbled discolorations of the skin, and chaps or cracks in the cuticle, not unfrequently followed by ulceration. Such effects are commonly seen on the forepart of the legs of aged individuals, who sit almost continually before the fire. In a still higher degree, radiating heat will bring on redness, vesication, and all the consequences usually noticed in the first and second species of burn presently to be described.

A *scald* signifies an injury arising from the application of a hot, or boiling fluid to the skin, or a mucous texture. The effect of the momentary application of very hot water to the surface of the body is to produce pain and redness, followed by a degree of swelling. When the scald is some what more severe, the cuticle is raised from the cutis in the form of transparent vesicles, filled with a serous fluid. Here the same change takes place, as follows the application of a blistering plaster, and this with such quickness, that it has been proposed in some urgent disease to employ hot water as an expeditious mode of forming a blister.

As water boils at 212 deg. of Fahrenheit's thermometer, the degree of heat, and consequently, so far as this is concerned, the severity of the injury itself, attending a common scald, are kept within a certain limitation. The mischief is therefore generally more superficial, than that resulting from burns. But, even in this respect, something will depend *upon the length of time the hot or boiling fluid is applied*, and *the kind of fluid itself;* because oil, greasy soups, and some other liquids, with which these accidents are frequently occasioned, not only take a higher temperature than that of boiling water, but adhere longer to the parts.

Perhaps, the worst scalds happen to workmen, who fall into coppers of boiling wort, or to firemen from the descent of boiling water from a building in flames upon their thick clothes, from which they cannot quickly extricate themselves. I have attended several children who were most severely scalded in nurseries, by falling into tubs of hot water carelessly left in their way ; and I have known many children die from the accidental spilling of a basin of hot tea or coffee over their breasts and bodies.

In most of these examples, the injury, though necessarily severe on account of its extent, is much and dangerously aggravated by the protracted duration of the contact of the hot fluid with the surface of the body. Hence, there is not only an extensive scald, but one, which, if the patient live long enough, will proceed to ulceration and eve, sloughing. But, although scalds are mostly injuries of a more superficial kind than burns, they are frequently perilous on another account—namely *their great extent*, arising from the quantity of the hot fluid applied, and the rapidity with which it diffuses itself over the integuments.

One case of scald is of a particular kind, inasmuch as it does not arise from the application of any hot fluid to the skin, but to internal parts; and it involves questions respecting the treatment, which do not present themseves in other examples. Poor persons sometimes let their children drink out of the spouts of kettles and teapots. Now this is often the cause of fatal accidents; for when such childen are left by themselves, they are disposed to drink out of the same vessels, which may now contain a hot or boiling fluid. The consequences are not always, as might be supposed, *a priori*, the symptoms of inflammation of the œsophagus and stomach, but of inflammation of the glottis and larynx, resembling those of croup, and, under such circumstances, tracheotomy may become indispensable to save the patient from impending suffocation. Dr. Marshal Hall, who first drew attention to this subject, suspected, that the hot or boiling fluid did not actually reach the stomach, or even the œsophagus, but that its course was arrested by a spasmodic action of the muscles of the pharynx. By passing to the fauces, he supposed that it only scalded the epiglottis and glottis, which became more and more swollen, until at length the rima glottidis was completely obstructed. This view is partly correct, that is to say, the larynx inflames from the injury which it receives; but a case, and the *post mortem* examination of it, recorded hy Mr. Gillman, prove, that the hot fluid sometimes passes much further than the foregoing account represents, the whole interior of the mouth, fauces pharynx, and œsophagus, nearly down to the cardiac orifice of the stomach, presenting the usual appearances of a scald. The lining of the trachea, however, was found considerably inflamed, with a layer of coagulating lymph adhering to it. In another case, published by Mr. Stanley, the mucous membrane of the pharynx, and upper part of the larynx, above the rima glottidis, were slightly reddened, but that opening itself was previous. The child died twelve hours after the accident.

A *burn*, denotes the inflammation and other consequences resulting from the application of high degrees of heat to the body, in every other manner than through the medium of water, or other fluids, which do not admit of a temperature much above 212 deg. When solid substances undergo rapid combustion, like phosphorus, sulphur, and resinous bodies, in general they occasion deep burns; but, in the contrary case, the intensity of their effects is in a ratio to their degree of heat, the duration of their application, and the tenderness of the parts. *Cæteris paribus*, a burn of parts, habitually exposed to the external air, occasions an injury of less depth than when it occurs on parts usually covered, and where, consequently, the cuticle is thin and incapable of affording equal protection to the cutis. Many individuals are severely burnt by the direct application of the ignited substances themselves, or of the flames issuing from them, to the uncovered parts of the body, as is exemplified in those who escape out of buildings in which the flames already occupy a considerable part of the interior. In other examples, the burn is caused by the clothes taking fire, when the ascending flames often severely scorch the breast, the neck, and face. In consequence of the light combustible materials of female dress, women more frequently receive bad and fatal burns in this particular way than men. On the other hand, various employments, exclusively followed by the male sex, as those of firemen and laborers in brewhouses, gunpowder-mills, distilleries, laboratories, founderies, and mines, particularly expose such classes to severe burns produced in other manners. I have seen many instances, in which men employed to extinguish fires, were not only dreadfully scalded by the fall of boiling water upon them from the heated bricks, but severely and fatally injured either by the descent of melted lead upon them from the gutters and pipes, or by their falling into the midst of the flames, in consequence of their having ventured upon walls or floors which gave way with them. Burns in such persons are sometimes conjoined with fractures, and other bad mechanical injuries.

Burns are divided into several kinds, the differences of which chiefly depend upon the intensity and duration of the heat applied to the parts. When the heat has not exceeded a certain degree, and its application has been very transient, the skin may be only a little reddened and tender; it may present merely an erythema, an efflorescence, or a superficial phlogosis of the skin, unaccompanied by vesicles. Such is the *first* or *slightest degree of burn*. In a few days, sometimes in a few hours, the redness, heat, and pain go off, and the inflammation terminates with desquamation. But however slight the burn may be, if it be extensive, the pulse will become accelerated, the tongue red, and sympathetic irritation of the mucous membrane of the alimentary canal may be excited. When the head is the seat of injury, the irritation is liable to be propagated to the brain, occasioning restlessness, delirium, convulsive twitches, coma, and even death.

In the *second degree of burn*, serous fluid is effused under the cuticle, and vesicles are formed, sometimes more immediately, but more commonly after a few hours.

In the *third degree of burn* more or less of the surface of the cutis is destroyed; a kind of mischief, indicated by grey, yellowish, or brownish discolorations, the parts so changed being thin, supple, and not painful, unless roughly pressed upon. The vesicles, which frequently take place over the points disorganised in this degree, are usually filled with a brownish or milky fluid, or a red serosity. In this description of burn, the pain, which usually subsides at the end of twenty-four or forty-eight hours, soon returns again with severity, and inflammation comes on around the eschars, which at length becoming detached, the sore heals, and a pale cicatrix remains. Although the pain of all burns is acute, it is much more severe when only the surface of the cutis is injured, than when it is more deeply destroyed; a fact, which Dupuytren justly regards as important with reference to the prognosis.

In the *fourth degree of burn*, there is a total destruction in the whole thickness of the cutis, together with a portion of the subcutaneous cellular tissue. The parts are converted into a deep ischar, of a yellowish or blackish color, dry, insensible and harder and tenser, in proportion as its color is darker. The sound skin around the eschar is wrinkled and pinched up, as it were, the folds showing the degree in which the burnt parts have shrunk and curled themselves up. At the end of three or four days, the pain begins to be severe; an inflammatory circle forms round the eschar, which generally becomes detached about the fifteenth or twentieth day; the bottom of the sore then consists of the subcutaneous cellular tissue; a copious suppuration ensues, but granulations soon spring up with vigor.

Following Baron Dupuytren's classification, I may next observe, that *burns of the fifth degree* only differ from the fourth, inasmuch as they extend to parts more deeply situated. The eschars, composed of muscles, fasciæ tendons, &c, sometimes include vessels and nerves which are not yet completely destroyed. The eschars are *black* and *brittle*, and require a longer time to be detached than those of a more superficial description. When they are produced by boiling liquids, however, they are soft, greyish, and so insensible, that on being touched no pain is experienced. The suppuration which ensues is profuse, and the subsequent cicatrix is full of irregularities, the motions of the part being irreparably lost in consequence of the locomotive organs being involved.

In the *sixth degree of burn*, implicating the whole thickness of a limb, the surface of the part is completely charred, hard, insensible, and brittle. Sanson refers to a young man, who put his foot into a gutter, just at the moment when some fused iron was about to run along it; the foot and ancle were annihilated in a moment.

Each of the different degrees of burns, according as a small or great extent of parts happens to be injured, may either be merely a local affection, as it were, or the cause of such constitutional disturbance as will endanger life. This general indisposition may be the immediate effect of the irritation of the burn, the shock of the injury, or the secondary effect of the stages of inflammatory reaction, of suppuration, or of hectic exhaustion, sometimes induced in the later stages of bad and extensive burns. A burn may occasion immediate death; but I believe this is not altogether from the severity of the pain, as stated by Dupuytren. In fact, he has himself noticed, that, in such examples, there is generally extreme congestion of the viscera, and effusion in almost all the large cavities. This quick fatality of burns, however, is more frequent in children and nervous females than in adults or old persons. If the patient be not killed in this sudden way, he may be seized with excessive agitation, restlessness, spasms, or convulsions, and his pulse may become small, quick, and irregular. In other instances, a state of stupor and prostration, or collapse, takes place, with a small hardly perceptible pulse, cold pale skin, slow difficult respiration, and shiverings, the limbs being motionless and relinquished to their own weight, and the patient either giving no answers to questions put to him, or answering them reluctantly and imperfectly. This condition will soon end in death, or be followed by a general reaction; a fever; which, when the burn is superficial, but somewhat extensive, will resemble that febrile disturbance which accompanies erysipelas, the pulse being frequent, the skin hot, the digestive organs disordered, and the tongue dry and red.

In many cases of deep burns, no particular constitutional disturbance occurs in the interval between the receipt of the burn, and the beginning of the detachment of the eschars. But, at this period, which (according to Dupuytren) is usually about the fourth day, *inflammation comes on*, attended with a great deal of severe pain. If extensive surfaces be burnt, either considerable gastric irritation will be noticed, or great oppression and difficulty of respiration, connected with determination of blood to the bronchial membrane and lungs. But should the patient be fortunate enough to get through all these dangers, he will yet have others to encounter, namely, such as depend upon the extensive ulcers left after the separation of the eschars, and upon the hectic symptoms brought on by profuse suppuration.

Amongst the worst complications of burns are tetanus, and phlegmonous erysipelas, which latter sometimes creates a necessity for amputation. Another complication of burns of the sixth degree is necrosis, or the death of bone.

Dupuytren enumerates four periods of danger as arising from burns:

1. The stage of irritation, as it is termed by him, or, as we should say, of the first shock of the injury on the system.
2. The stage of inflammation.
3. The stage of suppuration.

4. The stage of debility and hectic exhaustion.

The same distinguished surgeon has the merit of having first well explained, not only the complications of burns, but the *post mortem* appearances in fatal cases.

When persons perish in the flames, or soon after being removed from them, inflammation has not had time to invade the digestive canal, yet marks of great congestion are noticed. Not only does the mucous membrane exhibit red spots of greater or less extent, not only is it gorged with blood, but the cavity of the intestine contains a copious quantity of blood effused within it. The vessels of the brain are also fully injected with blood; the serosity in the ventricles has a red tint, which is likewise noticed in the fluid in the cavities of the pleura, pericardium, and peritonæum. The bronchi also contain a bloody mucous secretion, and their lining exhibits at various points a bright red color, and different degrees of capillary turgescence.

If the patients die between the third and eighth day, and are afterwards opened, traces of inflammation are noticed in the alimentary canal, brain, and lungs. If they die in the suppurative stage, ulceration of the bowels and enlargement of the mesenteric glands may be observed.

In many burns, the parts are so violently injured, that though they are not killed or decomposed at once, they undergo such inflammation as soon terminates in their conversion into *sloughs* or *eschars*, as they are here generally termed. When the eschars are deep or extensive, the derangement of the whole system will be great, there will be collapse, with pallid face, cold extremities, shiverings, vomiting, and frequently hiccough.

The mortification from burns differs from that called *traumatic*, or such as arises from mechanical injuries, in not having a disposition to spread beyond the extent of the injury; a fact of importance to be remembered in the prognosis.

From the foregoing account of the division of burns and scalds into several degrees, it must not be inferred, that each variety of them always corresponds at every point to one of those degrees; frequently it is not universally either a mere redness or efflorescence or redness with vesication, or a burn with ulceration, or with the formation of eschars. In bad burns and scalds, sometimes all these diversities of injury are exemplified in different parts of the burnt or scalded surface, according to the intensity or duration of the heat, or the disposition of the parts to be acted upon more or less quickly by it.

With regard to the *prognosis*:—1. The degree of danger materially depends upon the extent of the injured surface. A scald or burn of considerable extent often proves fatal immediately, or in a few hours, without the patient ever having rallied from the collapse. 2. The depth of the injury is another consideration influencing the prognosis. The deeper the effects of the burn extend, the greater the peril. 3. The situation of burns is also to be taken into the account; those of the head, neck, chest, and abdomen, *cæteris paribus*, being more dangerous than such as affect only the extremities. Scalds of the pharynx and larynx are remarkable for their fatality. 4. The age of the patient makes also a vast difference; infants being often carried off by convulsions, and very nervous persons sinking apparently from want of power in the system to bear the shock inflicted upon it; and delicate individuals, and others who lead irregular lives, or are of a gross corpulent habit, being far less capable of bearing the consequences of severe burns, than strong healthy individuals more careful in their mode of living. 5. In estimating the danger of burns, however, a judgment is not to be formed abstractedly either from the extent of a burn, or from its probable depth, but with reference to its extent and depth together, joined with other circumstances already specified. In fact, a burn of the worst or sloughing kind, if it be of little extent, and the patient's constitution good, may be attended with no severe indisposition whatsoever, while the most superficial scald, if extensive, may prove fatal; and the risk of this termination will be greater in proportion as the patient's age, or previous state of health and mode of living, may render him an unfavorable subject for the accident. 6. In delivering a judgment respecting the degree of danger from a burn, we are not to hold out too favorable a view on first inspection of the case, because, when the eschars and sloughs come away, the mischief may be deeper and more extensive, than first appearances might lead us to expect. 7. In the process by which suppurating wounds and ulcers heal, there is a principle in the animal economy exemplified, by which the contraction and absorption of granulations are brought about during and for some time after cicatrisation. It is in consequence of this contraction of granulations, that the circumference of the ulcer is powerfully drawn towards the centre, and the degree and force with which this happens are perhaps greater in the sores produced by burns, than in those resulting from any other cause. Hence the healing of ulcerated burns is liable to be followed by hideous disfigurement and contraction of parts, and even by a complete and permanent interruption of their functions. Thus, when the forehead or eyebrow is burnt, the eyelids are likely to become everted, *ectropium* may take place, and the eyeball, being deprived of its natural screen, may have its functions considerably impaired, or even destroyed, by repeated attacks of chronic inflammation, terminating in opacity of the cornea. In burns of the neck, if the patient live, the contraction of the granulations frequently brings on a wry neck, and, in worse cases, the chin is absolutely pulled down to the sternum, and fixed in this position. When this happens, the integuments are thrown into irregular folds, which, like so many cords or bands, seem to hold the chin downwards.

Sometimes the head is thus pulled towards the shoulder. I have seen deformity of this kind carried to such a degree, that even the lips were involved in it, and the mouth was horribly disfigured.

Sometimes the contractions, following burns, will fix a joint in a perfectly useless position, drawing the thumb or fingers quite back against the bones of the carpus, or holding the knee in a complete state of flexion, or the whole hand may be bent and fixed against the forearm, or the foot so twisted and deformed, as to be only a misshapen useless mass attached to the leg. The lower eyelid is sometimes drawn down, and adherent to the upper lip; or the lower lip is adherent to the chin. But, in order to convey an idea of the force, with which the contraction of the cicatrix takes place, I may quote a case recorded by Cruveilhier, where a burn of the forearm occasioned such a contraction of the skin, that the carpus was gradually dislocated from the radius. Dupuytren had a case, in which the penis became drawn up and fixed to the skin covering the linea alba; and another, in which the thigh was fixed in the bent position, the skin of the upper part of it being attached to that of the abdomen. The patient had a hernia, and when an attempt was made to extend the limb, thick longitudinal folds of the cicatrised parts projected, so as to prevent the truss from being applied.

These disfigurements, and useless conditions of parts from burns are not usually noticed after burns on the posterior parts of the trunk, because the movements of flexion, which are the most natural, oppose the contraction of the cicatrix; and the same observation is generally applicable to burns on the posterior surface of the limbs.

Now, although surgery has resources for the prevention and relief of some of these severe disfigurements and mutilations, the risk of their occurrence cannot be prudently overlooked in the prognosis.

Besides these ill consequences, frequently arising from the power with which the granulations contract during and after the cicatrisation of burns, serious deformities, and the loss of the use of parts, are often produced on another principle; namely, by the growth and adhesion of burnt parts to one another. Thus the eyelids sometimes grow together, and the same thing may happen to the toes or fingers, or the ears may be rendered adherent to the scalp. Sometimes the lachrymal puncta and canals are obliterated; sometimes the nostrils. Deep burns of the fifth degree usually lead to very serious consequences. From the destruction of the muscles and tendons, the use of the limb often becomes permanently lost; from the copiousness of the suppuration, the patient is rendered hectic, and likely to sink; from the denudation of the bones, and their long exposure to the air, they are in danger of being attacked with necrosis; from the synovial membranes being frequently injured, the joints are likely to inflame; and, when the large joints are thus involved, the only chances of recovery are either by anchylosis or amputation.

Burns of the sixth degree on the limbs necessarily require amputation.

In burns, according to Baron Dupuytren's investigations, the patient's recovery is frequently retarded for a long while by ulceration of the mucous coat of the intestines.

With respect to the *treatment of scalds or burns*, when the injury is superficial, the indication is to keep down the inflammation, and thus prevent or limit the formation of vesicles; but, if the latter purpose cannot be accomplished, we are to endeavor to prevent such vesicles from becoming troublesome painful ulcers. For slight burns and scalds, cold applications are frequently preferred. The injured part may be immersed in very cold or iced water, or covered with linen wet with an evaporating lotion, such as vinegar and water, the liquor plumbi acetatis dilutus, with a small quantity of camphorated spirit in it; or rose water, with a drachm or two of diluted acetic acid, and two grains of the acetate of lead to each ounce of it, or the diluted liq. ammon. acetatis. All these applications, in common use amongst surgeons, and some others in favor with the vulgar, like scraped potatoes, prove serviceable on the principle of reducing the temperature of the burnt parts, and thus diminishing and keeping off inflammation. In particular, they tend to check the effusion of serum under the cuticle, and the formation of vesicles; but, for this purpose, they must be put on the part very soon, and, if possible, immediately after the accident; because vesicles sometimes make their appearance almost directly after the receipt of the injury, and others follow with more or less quickness. When there is a disposition to shiverings, the pulse is feeble, the skin pale and cold, the patient faint, and the burn extensive or situated on the trunk, cold applications are improper. In such cases, we may either imitate Dupuytren, who applies fomentations, or put the patient, if a child, into a warm bath, or use what Sir Astley Cooper recommends, namely, spirit of turpentine, or a liniment of turpentine, linseed oil, and lime water, in equal parts*, afterwards resorting, however, on the reaction taking place, to antiphlogistic treatment, that is to say, after the pulse has risen, the patient has rallied, and a tendency to fever and inflammation has begun. Of late the practice of dressing superficial burns with *raw cotton*, has been introduced into this country from America.† The cotton is thinly spread out, or carded and laid directly over the burn. This practice was at first proposed chiefly for scalds and superficial burns; But Dr. Anderson, of Glasgow, represents it as advantageous for all kinds of burns, whether superficial or deep, vesicated or sphacelated. One great principle insisted upon by him, is that of not removing the cotton, unless compelled by circumstances, until the cuticle is formed, and the parts are enabled to bear exposure. The raw cotton is sometimes covered with a moderately tight roller.

---

* In superficial burns of the face, M. Velpeau is in favor of this common application; the parts being smeared with it four or five times daily with a feather. In five or six days, large burns of the first, and some of the second degrees, have been cured by it.

† Dellam, in Potter's "Medical Lyceum," p. 22.

With respect to the suggestion of allowing the cotton to continue long unchanged, it seems inconsistent with due attention to cleanliness, for the discharge would in many instances convert the cotton into a fetid mass of putridity, and, in hot weather, maggots would soon be deposited in it.

Another application to burns is *common flour*, plentifully sprinkled on the injured surface with a flour dredger. This practice has gained reputation, and been introduced into the London hospitals. No doubt, the exclusion of the air, the absorption of the discharge, and the idea of protecting the burnt surface with a remarkably soft application, were the considerations which first suggested this treatment. In its adoption, nearly the same rules are followed as in the use of cotton, the parts being kept constantly covered, and allowed to heal under the coating of flour formed over them. For the purpose of loosening the masses of flour when they require to be taken away, poultices are applied.

The *second class of burns*, or *those attended with vesication*, may be treated with refrigerant evaporating lotions, or with the lime water and linseed oil liniment, or with carded cotton, or common flour.

But the question here occurs, what are we to do with the vesicles? Should we discharge the fluid from them, or leave it undisturbed? Whatever be done, we cannot always prevent ulceration of the cutis from taking place under them. I believe, the occurrence is not much affected by the presence or discharge of the fluid from them, but depends rather upon the degree of injury, which the surface of the skin has sustained from the burn itself. In my own practice, when the vesicles are large, I generally let out the fluid by making a fine puncture with the point of a needle or lancet, a plan sanctioned also by the authority of Dupuytren. When the cutis is exposed, we may apply the unguentum creasoti, or liquor plumbi acetatis dilutis, with two grains of the sulphate of zinc to each ounce of the lotion, as an application that seems to promote the quick production of new cuticle.

The *third and fourth degrees of burns*, or *those in which the parts are so injured that eschars and ulceration are unavoidable*, may also be treated with the lime water and linseed oil liniment, emollient poltices, and fomentations, flour, or the turpentine liniment, which is sometimes preferred as the dressing for every kind of burns.

According to M. Velpeau, 'in a burn of the first degree, a compressing bandage prevents the development of inflammation; in one of the second degree, it hinders the occurrence of blisters, or, if not employed early enough to do this, causes the absorption of the effused serum. In a burn of the third degree, it cannot prevent an eschar, but it lessens the pain. M. Velpeau* generally prefers straps of diachylon plaster, or, in other words, the plan adopted by Baynton for ulcers. He states, that the first degree is constantly checked by surrounding the burn in such a manner, that the strap may remain seven or eight days. In the second and third degrees, the cuticle must be first removed, the surface cleaned, and the strapping renewed every third, fourth, fifth, or sixth day. In the fourth degree, it represses the surrounding inflammation, does not hinder the separation of the sloughs, and, as they become detached, it promotes cicatrisation. If suppuration be profuse, the straps are to be changed every other day; but, in ordinary cases, every third or fourth day. In the fourth degree, before the eschars are detached, M. Velpeau lets the strips remain five or six days. Very large burns are excepted from this treatment, which of course is only adapted to those of the limbs.

Suppuration is not the invariable consequence of vesicles, though it frequently follows them. Sometimes purulent matter is formed from the surface of the cutis, without any appearance of ulceration, and is at last stopped by the production of new cuticle. In other instances, small ulcerations occur on the surface or edges of the burn, and spread with more or less rapidity into extensive sores.

Immediately the ulcers begin to secrete healthy pus, and to form granulations, the applications above specified should be discontinued, and a mildly astringent ointment made use of, such as the calamine cerate, ung. creasoti (L. P.), blended with an equal quantity of lard, or the zinc and spermaceti ointments, mixed together in equal proportions.

Of all the sores which surgeons have to deal with, none are more disposed than those of burns to produce high fungous granulations, which seriously retard the healing process, and, if not repressed by suitable treatment, often terminate in the formation of an ugly, protuberant, dense, almost cartilaginous cicatrix. In Mr. Higginbottom's treatise on the nitrate of silver, cases of this kind are reported, in which it was necessary to apply this substance for the dispersion of the extraordinary mass of projecting new matter collected in the place of the cicatrix.

For the prevention of this description of deformity, the best method is to keep down the granulations by sprinkling them occasionally with powder of myrrh and calamine in equal parts, or by touching them from time to time with the nitrate of silver; or, if the situation of the burn will admit of the plan, by applying straps of adhesive plaster, or a bandage.

---

* See Revue Med. Juin et Juillet, 1835.

With regard to the *treatment of burns*, where the parts are reduced to an *eschar* at the time of the accident, or are so injured that they afterwards slough, we may either pursue the same practice which is applicable to mortification in general, that is, we may either employ emollient applications, poultices, and fomentations, or use such local means as are believed to have a specific virtue in the relief of sloughing burns. Amongst the latter applications, the turpentine liniment deserves to be particularly mentioned. Dr. Kentish, who first brought it into use, adopts the principle, that the increased action in the parts near the eschars should not be suddenly reduced, but supported until suppuration takes place. With this view, he first bathes them with warm camphorated spirit, or oil of turpentine, and then covers them with the turpentine liniment, consisting of ung. resinæ flavæ, diluted and softened with turpentine, and spread upon rag. When the secretion of pus commences, he discontinues the turpentine liniment, and applies milder dressings, such as the ceratum calaminæ, or ceratum plumbi acetatis. For repressing exuberant granulations, and absorbing the discharge, he uses powdered chalk, which he also introduces into the cavities of separated eschars, and into the furrows between sloughs, a pledget being then put on, and, in tedious cases, a poultice.

With respect to the dressing of burns in general, all surgeons concur respecting the advantages of keeping the injured parts well covered, and not exposed to the air, which has a decidedly bad effect upon them. They also coincide in the usefulness of dressing a burn much less frequently than was the practice in former days; indeed, many practitioners now make it a rule not to remove the first dressings until suppuration is established. On the same principle, when cold applications are used, we should not frequently take off the rags, but merely sprinkle them with the lotion as often as may be requisite to keep them wet. For the purpose, also, of not keeping the burnt surface long uncovered, we should not, when the burn is extensive, take off all the dressings at once, but only a part of them. No doubt, it is partly on the principle of keeping the burnt surface effectually excluded from the air, and partly on the principle of avoiding the pain and irritation of the frequent removal of dressings, that carded cotton, flour, and various liniments of turpentine, linseed oil, and lime water, produce their beneficial effects. A gentleman, who lately attended my lectures, informed me that, in the part of the country which he came from, burns were successfully treated by applying to them with a fine brush a solution of elastic gum in ether, which formed a kind of varnish or coating upon them, preventing the ill effects of their exposure to the air.

With regard to the *internal treatment*, when a scald or burn is of a severe description, *the first stage of danger*, the danger from the shock on the system, the period of irritation, as Dupuytren terms it, immediately presents itself, sometimes accompanied by violent agitation of the nervous system, but still more frequently by shiverings, paleness, stupor, coldness, weak pulse, and collapse. Now opium, brandy, ammonia, or ether may be given. Cold applications are to be avoided, bottles of hot water may be put to the feet and epigastrium, and the patient kept covered The warm bath for children is in this stage particularly recommended by Dupuytren. When the collapse goes off, and fever and inflammation come on, we are to adopt antiphlogistic treatment, bleed young robust subjects, and administer opium.

The second period of great suffering and danger is when the eschars and sloughs are beginning to loosen: the *stage of elimination*, as it is named by French surgeons. The constitutional disturbance now runs high, and, when the patient is strong and young, bleeding may be necessary, together with leeches, and opium. According to M. Velpeau, the application of leeches around eshars prevents or lessens inflammation and erysipelas.

The third stage of danger is that of suppuration, when the profuse discharge may be such as the patient cannot safely bear: purgatives and astringent lotions are now proper to check it, followed by bark, dil. sulph. acid, a moderate quantity of wine, and opium. For the diarrhœa, to which burnt patients are subject in the suppurative stage, Dupuytren prefers giving half a grain of opium, and one of sulphate of zinc, three or four times a day.

The fourth stage of danger is when hectic symptoms have been induced by the long duration of the effects of the injury, the irritation, pain, discharge, &c. Here we must act according to the principles explained in the article on hectic fever, support the strength, give opium, &c. The occasional complication of burns with pleg-monous erysipelas, tetanus, or the determination of blood to internal organs, will of course demand particular remedies.

[The treatment of scalds and burns seems to us to be eminently empirical, in all our systematic works on surgery, if we may infer any thing from the contrariety of the remedies which are recommended. Hot substances and cold, cotton carded, scraped pototoes, spirits of turpentine, linseed oil and lime-water, flour, &c. &c., all have their advocates, and they are all good when they are indicated. The question is, when are they indicated. Many of them never, for *Scalds and Burns*. The cotton is good for nakedness, and the potatoes and flour for an empty stomach.

There are three varieties of lesion in scalds and burns, depending upon the extent of the injury; viz. *Rubefaction*, *Vesication* and *Disorganization;* and when we carry the division further, as Dupuytren has done, we may go on to twenty divisions, with as much propriety as to six. Each of these divisions may vary in extent, but there can be but these three well defined varieties.

The cause of this lesion, is the application of an excess of a natural stimulus to the living part, producing an undue excitement of the vessels and nerves, which results in their debility or death.

Now such things being the fact, the enquiry comes up as to the kind of treatment indicated. The answer is plain. We require the use of such agents, as are calulated to meet the existing debility. The whole practice rests upon the most rational basis.

In the first variety, where there is Rubefaction, there is generally not much required for the general system; but locally we have cold applications recommended, and these answer if the heat is great, but they must not be long continued. These allay the nervous irritation and this is followed by a return of the vessels to their physiological state. The same result may be better reached by the use of pressure or the application of some stimulant which induces the vessels to contract. For this purpose, we can employ warm turpentine, or we may cover the part with oiled silk. In a short time the pain subsides, and a free perspiration takes place under the application.

In the second variety, when there is vesication; if the lesion be extensive over the trunk or if it involve the palms of the hands and soles of the feet, there will be both general and local symptoms, indicating both general and local treatment. The most prominent of these symptoms is great nervous prostration. In order to meet the indications in this state, we should employ warm brandy and water with the tinctura opii *pro re nata*, until reaction is established, after which, we must regulate the reaction, that it may not run too high. This is to be accomplished by such remedies as excite the secretions, as antimony and opium, or Doveis' Powder, specacuanha, and calomel. General bleeding is commonly indicated, by the great tendency in such cases to a typhoid condition of the system. After suppuration commences, the patient must be sustained by tonics and nutrients. As to the local treatment, the patient suffers almost beyond endurance, if the parts are not kept WARM. Cold substances are advised by some in these cases, but nothing is more painful or more fatal. Never allow the cuticle to be torn, if it can be avoided, for that, and the serum effused under it, form the best protection to the injured nerves of the cutis. Warm and emollient applications, are grateful and soothing to the patient;—cataplasms meet the indications, but their weight is a great objection to their use. The best treatment, is the application of patent lint, wet with a decoction of poppy leaves; and over this, a covering of oiled silk. This may remain from twelve to twenty-four hours, without removal, which is a great desideratum, as the more the air can be excluded, the better. If suppuration follow, and the granulations become *lirid* and exuberant, let them be dressed over with Spts. Tereb. or Tr. Iodine, and employ moderate pressure.

When these Scalds and Burns are upon the trunk, and there has been a copious suppuration, unless we are guarded in our treatment, as cicatrization takes place and the secretion is diminishing, there will occur suddenly and unexpectedly, effusion upon the brain or lungs, and death. As the suppuration is subsiding, therefore, the bowels should be kept open and the diet should be curtailed.

In the third variety, when there is disorganization, we have only to follow the principles which guide us in sloughing from other causes.—ED.]

OF DEFORMITIES BROUGHT ON BY BURNS.

Burns of the head and face are particularly liable to occasion more or less deformity by the contraction of the cicatrix, because the tissues of the face are remarkably moveable and extensible, and no position of the head has any effect in counteracting the influence of such contaction. Bandages, splints, and other mechanical contrivances, are here, also, totally inapplicable and useless. Some trivial good may result, however, from keeping the skin drawn in the opposite direction to that in which its contraction would be disadvantageous, by means of straps of adhesive plaster. We may also make free use of nitrate of silver to repress the high granulations. When, however, the burn is on the neck or limbs, a great deal may be effected by mechanical means, adapted to maintain the head or limb in the opposite direction to that in which the contraction of the cicatrix would otherwise draw the part. Thus, supposing the skin of the front of the arm to be in a state of ulceration from a burn, if we maintain the limb extended, the cicatrix cannot diminish in the long axis, but transversely, so that a permanent flexion of the arm will be prevented. The plan is to be continued for at least two months after the healing is complete, for, without such precaution, deformity will still follow; but passive motion should be begun sooner. Fabricius Hildanus notices the practice of cutting away the horny scars and indurated substances left by burns; a method revived by the late Mr. Earle, who found that merely dividing the cicatrix and fræna would not suffice. His plan consists in cutting away the whole of the indurated substance of the cicatrix, and in then bringing the sides of the wound together transversely by means of adhesive plaster. The aid of machinery and splints is not to be neglected. On the other hand, Baron Dupuytren deems this practice unnecessary, and declares, that the simple but complete division of the cicatrix and its fræna at several points will answer every purpose, if, by so doing, we can bring the limb or part again into its right position, and the injury has not been such as to involve the muscles, or to have caused anchylosis.

The limb is then to be kept extended by machinery, splints, or bandages. When the part cannot be put into its proper position directly after the division of the indurated cicatrix and fræna, a slow and gradual extension is to be kept up: for this purpose, splints made with a screw, by which they can be bent to any convenient angle, are of great service. After the division of the cicatrix at several points, and the restoration of the part to the desirable position, the treatment is to be conducted on the same principles as are applicable to a burn, on the separation of the eschars and the commencement of the granulations. If new fræna begin to form again, they must be cut through without hesitation. When parts are merely adherent to one another, the following rules of practice are laid down by Dupuytren:—1. We are to divide them freely, and somewhat beyond their origin. 2. We are then to keep the divided surfaces apart. 3. Next, we are to make methodical and constant pressure on the point whence cicatrization must proceed, the angle of union.

When any natural opening is *contracted* or *obliterated* in consequence of a burn, we are either to enlarge the contracted aperture, or to restore the obliterated one by a perforation; then a tent or ivory tube, of considerably greater diameter than the natural opening, is to be inserted, and worn, not only during the healing process, but for a long while after it.

◆

EFFECTS OF COLD.

Of the general exciting or stimulant power of heat there can be no doubt; and, with regard to cold, the disputes concerning its operation have been perpetuated only by logical illusion. In common language, we are accustomed to speak of cold as a positive and active energy, while philosophy can acknowledge it only as the expression of a relative decrease of temperature; for any degree of temperature designated by the appellation of cold is still heat.* The very same temperature may be called hot or cold, according as it is compared with a colder or a hotter temperature. If we warm one of our hands at a fire, while we cool the other by means of ice, and then plunge both of them into water of the common temperature of the atmosphere, the water will feel cold to the hand which has been heated, and warm to the other which has been cooled.

In a physical sense, every temperature of the air, or other surrounding medium, below 98 deg. might be denominated cold, because this is the common heat of the human body; but, with regard to the feelings and the health, a degree much lower, namely, from 60 deg. to 65 deg. is the most grateful and invigorating. The external medium, at the temperature of about 62 deg. appears to abstract the heat of the body in the same proportion in which it is generated, without any extraordinary exertion of the system; and, therefore, neither contributes to exhaust its powers, nor to excite uneasy sensations. Hence, also, the denominations of temperate, warm, hot, cool, and cold, are given to particular degrees of the thermometric scale. The sensations of different men vary, however, according to the power which their respective constitutions possess of evolving heat. This depends much upon the original vigor of the system, especially of the heart and arterial system. It is also much influenced by habit, or by a person's being seasoned to the cold. Hence, people who, from vigor of constitution or from habit, readily evolve a considerable quantity of heat, especially during moderate exercise, can bear with pleasure and benefit to their health the very same degree of cold, which to the weak and unhabituated is a source of painful chilliness.

---

* Kellie, in Edinb. Med. and Surg. Journ. vol. i. p. 305. The latter part of the above remark may be said to be generally true, with respect to any degree of cold of which we ever speak, though rules for calculating the zero of heat have been given. See Essays on subjects chiefly Chemical, by W. Irvine, M D. 8vo. Lond. 1805.

The first effect of certain degrees of cold, applied to the human body, is to weaken the circulation through the small cutaneous vessels, more especially those which are situated in extreme parts, like the hands and feet; or, in projecting parts, as the ears, nose, scrotum, &c. which expose a larger surface to the atmosphere, or medium, by which their caloric is abstracted. Hence the skin becomes pale, and, contracting round the miliary glands and roots of the hair, exhibits a roughness which is compared to the skin of an unfeathered goose, and is technically named the *cutis anserina*. The action of the heart and arteries in general becomes weakened; and the blood being partially delayed in its course through some of the cutaneous vessels, and not undergoing the change of color which the circulation through the lungs produces, it gives a bluish or livid color to the fingers, ears, and other projecting parts. If the cold be intense, or the exposure long continued, the circulation in the extreme parts becomes altogether interrupted, and, the power of evolving heat being completely destroyed, mortification is the consequence. Parts killed in this manner are said to be *frost-bitten*.

From the languor and weakness of the arterial system, produced by the application of cold, other effects on the constitution necessarily accrue. A free circulation of well-oxygenated blood seems essential to the perfect execution of the functions of the brain and nervous system, and to the support of sensibility. If the circulation is suspended for a few moments, as in syncope, the sensibility is also suspended; and, on the other hand, when there is more than an ordinary supply of blood to any part, as in inflammation, the sensibility is highly augmented. Hence, another immediate effect of the agency of cold on the human body is a diminution of the sensibility of arts. This is universally felt in numbness of the hands and fingers, which, under the impression of cold, are altogether incapable of accurate discrimination of touch; and the whole of the surface of the skin partakes of the imperfect feeling. The tongue is also incapable of distinguishing the peculiar flavor of sapid bodies, if they be extremely cold; and the sense of smell is considerably enfeebled by cold. If the cold be intense, or its application long continued, the powers of the whole nervous system yield; a torpor of the animal functions ensues; the action of the muscles becomes feeble, and scarcely obedient to the will; an unconquerable langor and indisposition to motion succeed; and drowsiness comes on, ending in sleep, from which the person, if not speedily roused, frequently awakes no more.*

The strong propensity to sleep, following the anxiety and lassitude experienced at an earlier period, is noticed by most writers as the precursor of imminent danger†; and it is certainly a symptom of usual occurrence. But, as an intelligent author remarks, it is doubtful how far the state of sleep is the necessary consequence of simple exposure to cold; or, at least, what other circumstances besides cold are necessary for its production, since this exposure may be made to an intense degree of cold, for a considerable length of time, without sleep being induced.‡ The case of Elizabeth Woodcock§, who lay buried under snow more than a week, without sleeping a great deal, and those of some shipwrecked sailors, who were more or less immersed in water, in severe weather, for twenty-three hours, without being seized with drowsiness, are proofs that an irresistible propensity to sleep is not constant.¶

In describing the manner in which the French soldiers perished from the severity of the cold in Russia, Larrey remarks that their death was preceded by a paleness of the countenance, by a sort of idiotism, difficulty of speech, weakness of sight, and even a total loss of these faculties. In this state, some of the men continued to march, for a greater or lesser time, led by their comrades. The action of the muscles gradually grew weaker; the men realed about as if they were drunk; and their debility increased until they fell down—a certain sign of the total extinction of life. The incessant and rapid march of the troops in close masses obliged those, who could not bear it, to quit the centre to walk along the side of the road. Separated from this compact column, and left to themselves, they soon lost their equilibrium, and fell into the ditches of snow, from which it was hardly possible for them to get out. Here they were immediately seized with a painful numbness, followed by lethargic drowsiness, and in a few minutes their miserable existence terminated. Frequently, before death, there was an involuntary emission of urine, and sometimes hemorrhage from the nose. Almost all the men who perished in this manner were found lying with their faces downwards. The skin was without alteration or color, or any appearance of gangrene. In general, death took place more or less rapidly, according as the subject had been fasting a longer or shorter time*.

---

* See a description of the effects of the cold at Terra del Fuego, on the persons who landed there with Dr. Solander and Sir J. Banks, as detailed in Captain Cook's first voyage.

† Richer, Anfangsgr. der Wundarzn. b 1. p. 117. Larrey, Mem. de Chir. Mil. t. iv. p. 106. Callisen, Syst. Chir. Hod pars. i. p. 308.

‡ Thomson's Lect. on Inflammation, p. 624.

§ Reeve's Essay on Torpidity, p 109.

¶ Phil. Trans. 1792; and Currie's Med. Reports on the Effects of Water, vol. i. chap. 15.

It has been a question, whether the human body, after being frozen, can ever be restored to life. Richter asserts the possibility of recovery, *when the blood in the heart itself is not turned into ice; when this organ and large bloodvessels still retain a degree of vitality; and there is no extravasation in the brain* to render the thing impracticable. And he declares that persons, who have lain in a frozen state as long as four and six days, have been restored to life,† After a full consideration of this subject, I think there can-be no doubt that Ritcher is in error; and that the cases of recovery to which he adverts were only instances of restoration from a state in which suspension of sensation, voluntary motion, &c. had been induced by cold, and not examples in which the whole body, or even the greater part of it, had been frozen. In order to ascertain the truth or falsity of an assertion, that some animals, especially serpents and fish, can recover their vitality after being frozen, Mr. John Hunter instituted a number of interesting experiments on the power of different animals in resisting the agency of cold. Two carps were gradually frozen, with the aid of a freezing mixture, and did not recover. It was with great difficulty that he succeeded in freezing a dormouse, such were its powers of evolving heat, and the non-conducting quality of its integuments; and it was not till the hair had been wetted that life was destroyed. This animal, also, did not recover. When a toad was exposed to a similar cold mixture, the water froze round the animal so as to enclose it, but without destroying life: yet, though not frozen, it hardly ever recovered the use of its limbs. The conclusion drawn from these experiments was, *that an animal must be deprived of life before it can be frozen.*‡ On the other hand, Hearne says, that spiders, frozen so hard as to bound from the floor like a pea, were revived by being brought to the fire. Leeches, snails, grubs, and frogs, have been frozen to a certain degree by artificial cold, and revived. Other experiments have also proved, that frogs would revive even if the heart was frozen, but not if the brain congealed, after which they could not be affected by the galvanic action.§ Captain Franklin, in his northern expedition, repeatedly saw fish, especially carp, recover after having been congealed by cold into a solid mass of ice; and one carp recovered so far as to leap about with much vigor after it had been frozen for thirty-six hours.[*] We learn from Professor Thompson, however, that, in the year 1785, a variety of experiments were made at the Royal Medical society of Edinburgh, in order to discover some of the effects which exposure to intense degrees of cold produces upon warm-blooded animals. In these experiments it was uniformly observed, that death took place long before the irritability of the heart and other internal parts was destroyed, and at a time when the temperature of the blood, circulating in the heart and larger blood-vessels, was but little, if at all, reduced below 60 deg. of Fahrenheit.[†] How far these various facts can be reconciled by the different effects of artificial and natural freezing, or by the less pernicious operation of severe cold upon similar classes of animals in the polar regions than in milder climates, I cannot presume to conjecture; but I have no doubt that, in whatever manner this physiological question may be hereafter settled, with respect to the lower animals, the truth of Mr. Hunter's inference, with regard to the human subject, will remain unshaken. Whoever will advert to any of the most remarkable examples on record, where persons have recovered after being exposed for a length of time to extraordinary cold, will find that the particulars by no means justify the conclusion, that such cases were instances in which the whole body, or the greater part of it had been frozen. We may be sure that this did not happen in the case of Elizabeth Woodcock, who lay buried six feet under the snow, and without food, from Saturday, Feb. 2d to Sunday, Feb. 10th, 1799; for it is expressly related that she was sensible the whole time,[‡]; a state, which cannot be supposed to be compatible with the general congelation of the blood and other fluids in the system. The French peasant Boutillat was lost in a snow storm on the Black Mountains, which separate France from Spain, and lay asleep under the snow four days; but on the fifth morning he awoke with a sensation of thirst. How could this return of sense and intellect have happened, had the whole mass of the blood been in a frozen state? Or, if it be thought that the fluid was in a state of congelation only while the man lay asleep and senseless, by what alteration of circumstances is the thawing of the blood to be accounted for, since he awoke buried under the snow, breathing through a hollow cone, which, as in the instance of Elizabeth Woodcock, extended from his body to the surface of the snow?[§] Nor could the circulating fluids have been frozen to a great extent in three other individuals, whose remarkable case is upon record, since, in such condition, they could not have been in constant dread of being starved.[*] The very existence of sensation and intelligence proves that, in none of these cases, a completely frozen state of the body or of the blood could have taken place. Had this last state been induced, no doubt recovery would have been out of all possibility, notwithstanding the contrary sentiments which have been published on this point by Fabricus, Hildanus, Richter, &c.[†]

---

* Larrey Memoires de Chir. Militaire, t. iv. pp. 127—129. His description, however, is rather that of people dying from the combined effects of cold, hunger, and fatigue, than from cold alone.

† Richter, b. i. p. 119.

‡ See Philosoph. Trans. vols. lxv. and lxviii.; and Hunter on certain Parts of the Animal Œconomy, pp. 100, 101.

§ Quarterly Review, No. lvi. p. 382.

---

[*] Franklin's Journey to the Shores of the Polar Sea, p. 248., 4to. 1823.

[†] Thompson's Lect, on Inflammation, p. 642.

[‡] Reeve's Essay on Torpidity, p. 169.

[§] Pilhes, in Journ. de Medecine. Paris, 1767, tom. xxvii.

TREATMENT OF PERSONS IN A STATE OF TORPOR OR SUSPENDED ANIMATION FROM COLD.

One great principle insisted upon by pratical writers, is to let caloric be communicated to the body in the most gradual manner.[‡] From observations and experiments (says Mr. Hunter), it appears to be a law of nature, in animal bodies, that the degree of external heat should bear a proportion to the quantity of life. When life is weakened, this proportion must be adjusted with great accuracy; but, when the powers of life are considerable, a greater latitude is allowable. "I was led (he observes) to make these observations by attending to persons who are frost-bitten, the effect of cold in such cases being that of lessening the living principle. The powers of action remain as perfect as ever, but weakened, and heat is the only thing wanting to put these powers into action; yet that heat must at first be gradually applied, and proportioned to the quantity of the living principle, which increasing, the degree of heat may likewise be increased. If this method is not observed, and too great a degree of heat is at first applied, the person, or part, loses entirely the living principle, and mortification ensues. Such a process invariably takes place with regard to men, and the same thing, I am convinced, happens to other animals. For, if an eel is exposed to a degree of cold, sufficiently intense to benumb it till the remains of life are scarcely perceptible, and still retained in a cold of about 40 deg., this small proportion of living principle will continue for a considerable time, without diminution or increase; but, if the animal is afterwards placed in a heat of about 60 deg. after showing strong signs of returning life, it will die in a few minutes. Nor is this circumstance peculiar to the diminution of life by cold. The same phenomena takes place in animals which have been very much reduced by hunger. If a lizard or snake, when it goes to its autumnal hiding-place, is not sufficiently fat, the living powers are, before the season admits it to come out, very considerably weakened, perhaps so much, as not to permit of the animal being again restored. If animals in a torpid state are exposed to the sun's rays, or placed in any situation which by its warmth would give vigor to those of the same kind, possessed of a larger share of life, they will immediately show signs of increased life, but quickly sink under the experiment, and die; while others reduced to the same degree of weakness, as far as appearances can discover, will live for many weeks, if kept in a degree of cold proportioned to the quantity of life they possess. "I observed, many years ago (says Mr. Hunter), in some of the colder parts of this island, that, when intense cold had forced blackbirds or thrushes to take shelter in outhouses, such of them as had been caught, and were, from an ill-judged compassion, exposed to a considerable degree of warmth, died very soon."*

---

[*] Narrative of three women saved, who were buried thirty-seven days under the snow, in a stable at Bergemoletto, in Italy, by F. Soumis. 12mo. 1789.

[†] For many judicious observations on this topic, consult Thomson's Lect. on Inflammation, pp. 642—644.

[‡] Richter, Anfangsgr. b. i. p. 123. Callisen, Syst. Chir. Hodiern. t. i. p. 309.

I have deemed it advisable to cite these sentiments of Mr. Hunter, with some of the facts upon which they are founded, in consequence of my having read, in some modern works of high repute and extensive circulation, that, in cases of suspended animation, or torpor from cold, the patient may be safely brought into a warm but well ventillated room, chafed with warm flannels, and his feet and legs immersed in warm water.† Dr. Kellie does not think the same caution and reserve necessary in the application of heat to a case of general torpor, as to benumbed and frost-bitten limbs. In the latter occurrence, he admits, heat should be very gradually communicated; but, (says he) surely we would not commence the treatment of a case of general torpor, nearly approaching to death, by applying snow to the body. He argues, that there does not appear to be the same danger of violent reaction, or of destroying by premature stimulation, an accumulated excitability in general torpor, where the sensorial functions have been all along suspended, as in a partial affection, where, notwithstanding the injury done to the part, the general powers of the system have remained excitable. Notwithstanding the ingenuity of the reasoning which Dr. Kellie has adopted, I am far from thinking the practical principles, to which the observations of Mr. Hunter tend, are at all erroneous. The case, related by Dr. Kellie, was not an example in which the vital powers were reduced altogether by cold. The temperature, to which the individual had been exposed, was not, indeed, depressed to a degree generally incompatible with activity and life; but he was reduced by fatigue and fasting, and the effects of the atmospheric cold were increased by the drizzling rain which fell. The blood which flowed from the arm was judged to be of its natural temperature. This was, therefore, a case in which the temperature of the patient could hardly have been low enough to afford any criterion of the safety or danger of suddenly exposing a person to much warmth, who has been subjected to the effects of intense cold. If the facts mentioned by Hunter had left this matter doubtful, we might still be convinced of the truth of his observations by other events upon record. The limbs of the peasant Boutillat, whose case I have already noticed, were covered with warm linen, dipped in aromatic liquors: his feet mortified, and he lost his life. These consequences, Dr. Pilhes thinks, might have been avoided by the use of cold applications.* The ample experience of Larrey, who was an eye-witness of all the disasters of Napoleon's campaign in Russia, appears also to confirm the truth of the principle inculcated by Hunter, Richter, Callisen, &c. In describing the sufferings of the French army from the rigor of the climate, Larry exclaims, "Woe to the man benumbed with cold, whose animal functions were nearly exhausted, and especially whose external sensibility was destroyed, if he entered too suddenly into a warm room, or came too near the fire of a bivouac! The prominent parts benumbed or frozen, at a distance from the centre of the circulation, were seised with gangrene, which made its appearance at the very instant, and spread with such rapidity, that its advances were perceptible by the eye, or the individual was suddenly suffocated with a kind of turgescence, which appeared to affect the brain and lungs: he perished as in asphyxia. Thus died the chief apothecary of the guards. He had arrived at Kowno without any accident, but his strength was much reduced by cold and abstinence. An asylum was offered him in a warm apartment in the pharmacy of the hospital. He had scarcely been a few hours in this atmosphere, so new to him, when his limbs, in which he had lost all feeling, became considerably swelled; and he expired soon afterwards, in the arms of his son and one of his colleagues, incapable of uttering a single word. We saw some individuals fall down stiff-dead in the fires of the bivouacs," &c.†

---

* Observations on certain Parts of the Animal Œconomy, by J. Hunter. 4to. p. 187. 2nd edit. Lond. 1792.

† Kellie, in Edin. Med. and Surgical Journ. vol. i. p. 312. Rees's Cyclopædia, art. *Cold.*

In describing the treatment of a person in a state of torpor, or suspended animation, from cold, Callisen and Richter rigorously adhere to the principle, that caloric should be very gradually communicated to the body. The former recommends long-continued frictions with snow, or cloths wet with very cold water. This is to be done in a cold room; and he advises the surgeon not to let his endeavors cease too soon, as patients, after lying without signs of life for several days, have yet been snatched from the jaws of death. On the return of sense, motion, and warmth, aromatic spirituous applications may be used; the temperature in which the body is placed may be raised, and cordials administered.* When signs of vitality return, Richter directs strong violatiles and sternutatories to be applied to the nostrils, air to be blown into the lungs, and the fauces to be tickled with a feather. He also recommends the introduction of tobacco-fumes up the rectum; a practice, however, the propriety of which is questionable in all cases of suspended animation, on account of the debilitating, and even deleterious, effects of that plant. It might be better to throw warm wine into the large intestines, or inject it by means of a hollow bougie down the œsophagus. When the signs of returning animation increase, the body is to be rubbed with brandy, and conveyed into a warmer situation. A diaphoretic drink is then to be given; and, as soon as the patient has been well dried, he is to be put to bed, and remain there till he begins to sweat.†

---

* Journ. de Medecine, tom. xxvii.

† Mem. de Chir. Mil. tom. iv. pp. 184, 185.

Possibly, these eminent surgeons may have extended the principle too far, in directing the body to be at first covored or rubbed with snow. But, there is every reason to believe, that their method of showing the heat to be communicated only by degrees, is the most likely to be conducive to recovery.

TREATMENT OF FROZEN PARTS.

As, in all the experiments which Mr. Hunter made upon the freezing of whole animals, he had never seen life return by thawing, he was desirous of ascertaining how far parts were similar to the whole in this respect. He froze the ears of rabbits, and the combs and wattles of cocks, till the parts were so stiff and hard that, when cut, they flew from the blades of the scissors like a chip, and no pain nor bleeding ensued. After being thawed, they inflamed considerably; but in the end, perfectly recovered. There was thus a material difference in the result of his experiments, on the whole of some of the more perfect animals, and on parts of them. But, though it was thus fully proved, that parts of such animals might be froxen, and restored to their natural state, it was not known whether this would happen in the more imperfect animals. Mr. Hunter, therefore, froze the tails of a tench and two gold fishes, and endeavored to restore the vitality of the parts, by putting the fish into cold water; but the tails, when thawed, did not resume their original appearance: the fish were suspended with their heads perpendicularly downwards, and ultimately died. All his other trials to restore the life of other cold-blooded animals, or parts of them, after they had been frozen, also entirely failed.‡ Spallanzani found, that the irritability of the muscles of frogs, toads, and lizards was not destroyed by keeping these animals a good while in snow; but that, if the cold was increased, so as to freeze any part of them, the frozen part was invariably killed, and rendered insensible to stimuli.[*]

---

* Callisen, t. i. p. 309.
† Richter's Anfangsgr. b. i. p. 123.
‡ Obs. on certain Parts of the Animal Œconomy, pp. 124, 125.

The experiments, however, on warm-blooded animals corroborate what has long been believed, that when a part of the human body is simply frozen, without any impairment of its organisation, it may often be recovered by *gradual* communication of caloric to it. What parts of the human body admit of being frozen, without the destruction of life, and how long they may remain in this state with impunity (as Dr. Thomson remarks), are points, which observation does not hitherto appear accurately to have determined: but we know, that portions of the cheeks, ears, and nose, have often been frozen by exposure to the cold, and yet that, by a proper management, the vital functions of these parts have been restored. It seems probable, therefore, that a small part of the cutaneous texture may be frozen for a short period, without the necessary destruction of its vitality. But Dr. Thomson considers the restoration of a frozen limb a matter of impossibility; and, in the course of his reading, he has not met with a single unequivocal instance of such an event.[†] On this point he differs from Callisen and Richter, quite as much as upon the other question of the possibility of reviving the whole body, after it has been frozen. Whatever doubts may have been suggested, concerning the propriety of keeping patients of a warm temperature, who are in a state of torpor and insensibility from cold, none exist with respect to the prudence of extending this principle to the treatment of very cold or actually frozen parts of the human body. If a limb, that is not indeed frozen but excessively cold, be suddenly warmed, chilblains, frost-bite, and other more extensive forms of inflammation, are the result. The part swells, turns livid, and becomes affected with insupportable darting pain. And, when a part actually frozen is thus quickly warmed, the same symptoms arise, but in an aggravated degree, and rapidly end in mortification.[‡]

I have already cited some facts[§], strongly illustrative of the danger of exposing very cold or frozen parts to the fire; but, perhaps, on no occasion has the thing been more forcibly proved, than in the campaign of the French army, about the period of the battle of Eylau, During the three or four severely cold days previous to this action, the mercury had fallen to ten, eleven, twelve, thirteen, fourteen, and fifteen degrees below the zero of Reaumur's thermometer, and yet, until the second day after the battle, not a single soldier complained of any accident from the effect of the cold. "We had, however," says Larrey, "passed these days, and a great part of the nights of the 5th, 6th, 7th, 8th, and 9th of February in the snow, exposed to the most inclement frost." In the night, however, between the 9th and 10th, the temperature suddenly rose to three, four and five degrees above zero, accompanied with sleet. A thaw then commenced; and, from this moment, numerous soldiers began to complain of acute pain in their feet, numbness, sense of heaviness, and annoying pricking pains in their limbs. The parts were but little swelled, and of a dark red color. In some individuals, a slight redness was observed at the base of the toes, and upon the instep; while, in others, the toes had lost all power of motion, all sensation and warmth, and become black and dried. These patients, without exception, declared that they had felt no uneasiness while the severe cold lasted, and that their complaints first began at the commencement of the thaw. From these facts Larrey argues, that cold is not an exciting, but only a predisposing, cause of inflammation and gangrene *; a truth, which Richter appears to have been well aware of, when he observes, that cold alone, even the most intense, will never produce chilblains. †

---

[*] Opuscules de Physique, t. i. p. 118.

[†] Lectures on Inflammation, pp. 628. 642. "The fingers, toes, and nose may be frozen and perfectly recovered, if judicious means be employed; whereas, if the whole limb be frozen, it dies; and none of the higher animals can have the body congealed, and escape death."—Macartney on Inflammation, p. 99.

[‡] Richter, Anfangsgr. der Wundarzneykunst, b. i. p. 120.

[§] From Larrey's Mem. de Chir. Mil. t. 4.

In order to thaw a frozen part gradually, it is best to rub it with snow, or ice and cold water, until sensibility and motion return. If the ear or tip of the nose be the part concerned, care must be taken to avoid breaking it. As soon as marks of sense and motion are discerned, the friction may be made with brandy or camphorated spirit of wine. The patient may then have some gently diaphoretic drink, such as a little mulled wine, a basin of tea, &c. and be put to bed in a chamber where there is a fire. Here he is to remain until he begins to perspire, when a perfect recovery of whatever sensibility may have been lost generally succeeds.

When a part is almost in the state of gangrene, in consequence of improper exposure to sudden heat, sometimes its recovery may still be accomplished by immersing it in water of a temperature nearly as low as the freezing point. The part must be kept immersed until the swelling, pain, and marks of discoloration begin to diminish, when frictions with brandy, &c. may commence, and the warmth be gradually increased.

CHILBLAINS.

The inflammation attending chilblains is of a peculiar nature,

---

* Memoire sur la Gangrene seche causee par le Froid, &c. in op. cit. t. ii. p. 60.

† Richter, b. i. p. 124.

also irritable, yet languid; and, from the state of the circulation in the parts affected, the reparative power is low, and requires stimulation.*

A chilblain, in its mildest form, is attended with redness, heat, and itching of the parts affected which are generally either the toes, heels, or fingers, though sometimes the extremity of the nose, or ear, or parts about the metacarpus. In the next degree of severity, the parts are more swelled, redder, and so painful that the patient is deprived of the use of them; and, when the instep or back of the hand is the seat of the disease, the subcutaneous cellular tissue is swelled to twice or thrice its natural thickness, and the integuments are of a bluish or livid color. In a still more severe form chilblains produce vesication, or a rising of the cuticle, in consequence of the accumulation of a dark bloody serum under it. Beneath such vesications the surface of the cutis frequently ulcerates, and the sores thus occasioned usually discharge a thin ichorous matter, penetrate deeply, are excessively painful, and frequently very difficult to heal. Their bottom presents a greyish and often a fungous appearance. In the worst cases the inflammation ends in mortifiation, which is often preceded by the formation of bloody vesicles.

The sudden warming of a cold part, and the sudden cooling of a heated part, seem particularly conducive to chilblains: hence, parts most exposed to vicissitudes of heat and cold are most subject to the complaint; as, for instance, the toes, fingers, nose, ears, and lips. When a part is exposed to sudden cold, while it is in a state of perspiration, it is more likely to be affected with chilblains, than when thus exposed while simply warm. The most intense cold alone can produce true chilblains, though analogous comcomplaints do remain in limbs which have been frozen. The more irritable and tender the skin is, the more readily the complaint arises. Children, especially those subject to scrofula, young persons, females, and all who are brought up tenderly, who keep themselves warm, and unexposed to the air, and who perspire much in the feet, are particularly liable to chilblains. Chilblains, as Dr. Macartney justly states, occur with remarkable frequency in constitutions where the circulation is languid in the extreme parts, with a predominance of venous blood, indicated by a purple complexion, and the same color in the skin of the extremities appearing on exposure to cold.

One of the best applications to chilblains of the first and second sort is ice-cold water: the part affected is to be immersed in it a few minutes, two or three times a day, and then well dried and covered with a leather sock. Ice-water, or snow, is not, however, eligible for patients disposed to phthisis, or gout, nor for delicate females.* Astringent and stimulating applications are in more common use; such as the liquor plumbi acet., spir. vini. camph. tinct. myrrhæ, spirit of turpentine mixed with balsam copaivæ, linimentum camphoræ, linimentum ammoniæ, one part of tincture of cantharides diluted with six parts of soap liniment, or a mixture of two parts of spir. vini. camph. and one part of liquor plumbi acet.

---

* See Macartney on Inflammation, p. 99.

Ulcerated chilblains require stimulating dressings, as lint dipped in a solution of the nitrate of silver, Peruvian balsam, a mixture of liquor plumbi acet. and liquor calcis. or a lotion of the chloride of lime, as recommended by Lisfranc. A salve, containing the superacetate of copper, or the hydrarg. nitrico-oxydum, or touching the ulcers with the nitrate of silver, is often beneficial. If a poultice be necessary in the first instance, it may be made of oatmeal, with some port wine, or a proportion of the solution of chloride of soda in it.

Gangrenous chilblains should be treated according to rules explained in the remarks on mortification.

WOUNDS.

By a wound, surgeons imply a recent suddenly formed breach in the continuity of the soft parts, attended at first with hemorrhage, and generally produced by an external mechanical cause.

In a few instances, however, breaches of continuity, both in the soft and hard parts, are suddenly caused by the violent action of the muscles, which either tear themselves asunder, break the bones, or rupture the tendons, with which they are connected. Sometimes, also, the sharp point of a broken bone wounds the integuments, and changes the case into a compound fracture. Here we see, that the cause is mechanical, but not of an external kind, as in ordinary examples.

Wounds are divided into several kinds, the distinctions being founded either upon the sort of weapon with which the injury is inflicted, or upon the circumstance of a venomous matter having been inserted in the part, or, lastly, upon the particular situation of the wound, and the nature of the wounded parts themselves. Thus, the first class of wounds, consisting of *cuts*, *incisions*, or *incised wounds*, is produced by sharp-edged instruments, and generally free from all contusion and laceration. The fibres and texture of the wounded part have suffered no injury but their mere division; and there is, consequently, less tendency to inflammation, suppuration, gangrene, and other bad consequences, than in the generality of other wounds. Incised wounds, also, may usually be healed with greater quickness and facility than others which are more or less contused or lacerated: the surgeon has only to prevent the solution of continuity from gaping, or, in other words, he has simply to bring the opposite sides of the wound into contact, and to keep them in this state a few hours, and they will grow together.

---

* See Gibson's Institutes, vol. i. p. 46. ed. 5.

Another class of wounds is *stabs*, or *punctured wounds*, caused by the thrust of pointed weapons, like bayonets, lances, swords, daggers, &c., and also by the accidental and forcible introduction of considerable thorns, large nails, &c. into the flesh. These wounds frequently penetrate to a great depth, so as to injure blood-vessels, nerves, viscera, and other organs of importance; and, as they are generally inflicted with much force and violence, the parts suffer infinitely more injury than what would result from their simple division. It should also be noticed, that a great number of the weapons or instruments with which stabs are inflicted increase materially in diameter from the point towards the other extremity; and, consequently, when they penetrate far, they act like a wedge in forcing the fibres asunder, and thus cause a serious degree of stretching and contusion. It is on this account that bayonet wounds of the ordinary soft parts are very often followed by violent inflammation, extensive swelling, large abscesses, fever, delirium, and other unfavorable symptoms. The opening, which the point of such a weapon makes, is quite inadequate for the passage of the thicker part of it, which can only enter by forcibly dilating, stretching, and otherwise injuring the fibres.

A third description of wounds is *contused* and *lacerated* ones, which strictly comprehend, together with a variety of cases produced by the violent application of hard, blunt, obtuse bodies to the soft parts, all those interesting and common injuries denominated *gunshot wounds*. Many bites also rank as contused lacerated wounds. In short, every solution of continuity which is suddenly produced in the soft parts by a blunt instrument or weapon, that does not operate by means of a sharp edge or point, must be a contused or lacerated wound.

Poisoned wounds are complicated with the introduction of a venomous matter or fluid into the part. Thus the stings and bites of a variety of insects afford us examples of poisoned wounds. But a more serious and dangerous instance, which we meet with in this climate, is seen in the cuts accidentally received in the dissection of dead bodies, or in handling instruments infected with any irritating or venomous matter, as sometimes happens to the surgeon in the performance of operations on gangrenous limbs, and in dressing venereal and other infectious ulcers. The most dangerous, however, of all the poisoned wounds which ever occur in this kingdom, are those causes by the bite of the viper, and by that of several rabid animals, especially the dog and cat.

Wounds are farther divided by surgical writers into those of particular regions or parts of the body: thus, we have *wounds of the head*, *face*, *throat*, *chest*, *abdomen*, *limbs*, *arteries*, *veins*, *nerves*, *lungs*, *liver*, *&c. &c.*

Wounds may likewise be universally referred to two other general classes, viz. *simple* and *complicated*. A wound is called *simple* when it occurs in a healthy subject, has been produced by a clean sharp-edged instrument, is unattended with any serious symptoms, and the only indication is to re-unite the fresh-cut surfaces. A wound, on the contrary, is said to be *complicated*, whenever the state of the whole system, or of the wounded part, or wound itself, is such as to make it necessary for the surgeon to deviate from the plan of treatment requisite for a common simple wound. The differences of complicated wounds, therefore, must be numerous, as they depend upon many incidental circumstances, the principal of which, however, are hemorrhage, nervous symptoms, excessive pain, tetanus, a great degree of contusion, the discharge or extravasation of certain fluids, indicating the injury of particular bowels or vessels, the presence of foreign bodies, or of a poison or irritating matter in the part, loss of substance, an attack of hospital gangrene, phlegmonous erysipelas, &c.

All large or deep wounds are followed by more or less symptomatic fever, which usually comes on at a period varying from sixteen to thirty-six hours after the receipt of the injury, but sometimes much earlier. Its occurrence is indicated by a greater warmth of the skin; by an increase in the frequency, and generally, also, in the strength, of the action of the heart and arteries; by anxiety, thirst, and a suppression of the powers of digestion. The symptomatic fever from wounds is usually of the inflammatory character; and it even sometimes happens that a very high degree of it takes place in debilitated constitutions, and in persons who have lost a considerable quantity of blood. In these latter cases, however, the frequency of the pulse is more remarkable than its strength, and the fever puts on more of the asthenic than the truly inflammatory type. It is of great consequence to attend to the character of this fever; for the loss of blood, which may be required and sustained with impunity in one species of fever, may prove highly injurious, if not fatal, in the other.*

The danger of wounds is proportioned to their size; the degree of violence done to the fibres in addition to their mere division; the little power which the part has of repairing its injuries; its great importance to the constitution; the size of the injured bloodvessels and nerves, and the age of the patient, and the state of his constitution.

---

* See Thomson's Lect. on Inflammation, p. 202.

1. The removal of a large adipose tumor is often accomplished without injuring any part of importance, and yet the magnitude of the wound may occasion death.

2. A man cannot bear a large incised and lacerated wound equally well; because, in the latter case, the textures are not only divided, but stretched, and otherwise injured. I have seen the integuments covering the anterior surface of the tibia torn in a straight direction from the upper head of that bone nearly to the foot: a rapid mortification of the limb took place, and the man died. Had this heen a simple incision, such fatal consequences would not, probably, have happened, since the wound of amputation, even when a bulky thigh is removed, is not unfrequently the cause of death. All contused and gunshot wounds are, for this reason, more perilous than if they were simple breaches of continuity.

3. Joints seem to possess only an inferior power of repairing their accidental injuries, which often induce a state of irremediable disease in the part, or so violent a disturbance of the whole system, that the patient loses his life. I here more especially allude to wounds of the large joints; for the smaller articulations generally bear severe injuries as well as most other parts. Some organs are prevented from readily healing, owing to the continual or frequent passage of fluids through them. This is the case with all the ducts and outlets of secreting organs, the intestinal canal, the arteries, &c.

4. The slightest wound of a part, the functions of which are intimately connected with life, is often fatal: the brain, the cerebellum, the spinal cord, stomach, the bowels, &c.

5. When large arteries are injured, the hemorrhage, if not immediately stopped, will destroy life in a few seconds; and, when the main artery and nerve of a part are both divided, there is generally a considerable risk of mortification, in addition to the first danger from the bleeding.

6. Wounds in young, strong, healthy subjects generally heal more quickly and favorably, than in persons of advanced age, and impaired constitutions.

INCISED WOUNDS.

An effusion of blood from the divided vessels, pain arising from the division and exposure of nerves, and a gaping of the wound, or separation of its edges from each other, are the immediate effects of a wound of the skin, or flesh, with a sharp cutting instrument.

Almost every part of the body is furnished with a vast number of bloodvessels, which, indeed, exist in such myriads that it is impossible to prick the skin with the point of the finest needle, without opening one or more ramifications of vessels containing blood, which instantly oozes out. But this effect always happens in a greater and more remarkable degree when there is an extensive cut in the skin or flesh; and if any of the wounded vessels be above a certain magnitude, the hemorrhage may be profuse, and even immediately fatal.

The same experiment, which demonstrates the presence of blood-vessels in every situation, namely, the pricking of any part of the body with a needle, proves, also, that filaments of nerves exist every where, and at every point; for, the slightest prick of the skin occasions pain; and pain cannot happen except where there are nerves. The pain of wounds is observed to be more or less acute, according to the kind of instrument with which they are inflicted; the extent of the division; and, especially, according as the individual happens or not to be in expectation of the receipt of the injury. A patient, on whom an operation is to be performed, turns his whole attention to the effect which the use of the knife will produce upon his feelings, and he suffers a great deal: but if an incision be made when not expected, or when the mind is intent on other things, the agony is more moderate. Thus, a soldier may be wounded in the heat of battle, and not feel the hurt till the bleeding attracts his notice.

When the skin or flesh is divided with a cutting instrument, the edges of the wound separate from one another, and the injury presents a gaping appearance. The instrument itself, acting like a wedge, must unavoidably separate the parts between which it enters; but, if this were the only cause, the gaping would be very inconsiderable. We find, however, that the opposite surfaces of many wounds are drawn away from one another several inches; and the principal causes, to which the phenomenon is to be ascribed, are the natural elasticity of the skin, cellular tissue, fasciæ, &c., and the power of contraction inherent in the muscles.

The quality of elasticity which belongs to most animal substances, and is inherent in them even after they have been deprived of life, does not prevail in an equal degree in every texture. Hence, the degree of separation, produced by this cause, varies considerably, according to the nature of the wounded parts. The edges of an incision in the skin become widely drawn asunder, because the integuments are endued with great elasticity. The cellular tissue, when, cut, gapes very little, because it is less elastic. The extremities of a divided artery recede far from one another; the retraction being far greater than what happens in divided veins, which possess a much smaller share of elasticity. The muscles, also, are not remarkably elastic; yet, the sides of these wounds, especially those of the transverse kind, are always considerably separated from one another; but, this is not altogether owing to elasticity, but chiefly to a vital power of contraction inherent in muscular fibres.

The separation of the edges of a wound is also not always in proportion to the elasticity of the parts, but depends in some measure upon the degree of tension in which they happen to be at the moment of the injury. A simple experiment proves the truth of this observation. If the skin covering the knee be divided transversely in a dead subject, while the leg is bent upon the thigh, and another similar incision be made in the knee, while the leg is extended, the separation, which happens between the lips of these wounds, will be found to be much greater in the first than the second example.

The prognosis of incised wounds varies according to the extent and depth of the division, the nature of the injured parts, and several circumstances which rank as complications. Deep large wounds are more dangerous and difficult to cure, than those which only interest the skin. Wounds, accompanied with injury of large bloodvessels, or nerves, are more or less dangerous, according to the magnitude and importance of those vessels and nerves, and the possibility or impossibility of obtaining speedy surgical assistance. Simple cuts, in which the only indication is to bring the divided parts together, are the most favorable cases of all. On the other hand, complicated incised wounds are more or less serious and hazardous, according to the particular nature of the complication, whether this be a wounded artery, a vein, or nerve of magnitude and importance, a wounded excretory duct, a wounded bowel, a wounded trachea, œsophagus, &c. The complications, also, of bad health, and very advanced age, are other considerations which should influence the prognosis. Generally speaking, the most dangerous examples of incised wounds are those of the throat, made by persons who attempt to destroy themselves. Here there are so many large blood-vessels, nerves, and other organs of importance, that deep incised wounds too often prove fatal, either immediately, or in a short time. Sometimes the patient opens the carotid artery, and perishes of hemorrhage on the spot, before any assistance can be rendered. In other instances, he divides some of the principal branches of the external carotid, and after loosing a great deal of blood, faints, in which state the hemorrhage may cease for a little while. The fainting, indeed, is often the very thing which saves his life, by checking the effusion of blood until the surgeon arrives, who ties the vessels as soon as they begin to bleed again. Incised wounds of the extremities, when such arteries as the femoral and brachial are injured, may also suddenly destroy the patient, by the great quantity of blood sometimes lost before the arrival of surgical assistance.

In the treatment of incised wounds, there is frequently nothing to be remedied, except the simple breach of continuity, the cut fibres not having been stretched, contused, nor lacerated. When no artery of importance is divided, and no extraneous bodies are lodged in the wound, the duty of the surgeon consists in promoting the re-union of the divided surfaces without delay. It often happens, however, that considerable vessels are injured, and then the bleeding demands primary attention.

HEMORRHAGE.

According to the correct definition of it, laid down by Dr. Carswell, hemorrhage consists in the extravasation of blood, or the escape of this fluid during life, from the vessels in which it is contained and circulated, into the substance or on the surface of organs, whether it be retained in these situations, or conveyed to the external surface of the body. It may take place from the heart, arteries, veins, and capillaries, as the immediate consequence of a solution of continuity occasioned by incised wounds, puncture, laceration, ulceration, and mortification; or the sanguineous discharge may proceed from the capillaries, which present either no perceptible lesion of structure, or merely an increase of capacity, whereby the red globules are enabled to pass along these vessels, with the other constitutents of this fluid, which is poured out after the manner of extravasation.* Hemorrhage may be *arterial* or *venous*; *primary* or *secondary*; *active* or *passive*. One of the best classifications of the several forms of it is that adopted by Dr. Carswell, namely,—

1. *Hemorrhages from Physical Lesions*, comprising, 1st, those from wounds, ulceration, and mortification; 2dly, others, from a mechanical obstacle to the circulation, situated in the heart, or the blood-vessels.

2. *Hemorrhages from Vital Lesions*, comprehending, 1st, those from a modification of function of the capillaries, as exemplified in vicarious hemorrhage, and that from erectile tissue; 2dly, bleeding from a diseased state of the blood, as illustrated in scorbutus, some forms of pupura, and some of typhoid fever; 3dly, hemorrhage from debility.

In every wound, the bleeding demands the earliest attention, because, if loss of blood be not prevented without delay, the patient will frequently die in the course of a few seconds or minutes. Every other consideration may be deferred; but when large vessels are injured, they must be immediately secured, or else the sudden death of the patient will leave the surgeon no opportunity of exhibiting his skill and usefulness in other matters connected with the treatment.

Previously to considering what surgical means are best calculated for stopping hemorrhage, it seems right that I should advert to the nature of the process by which the bleeding from wounded arteries is permanently suppressed. As arteries are supplied, not only with small arteries and veins (the vasa vasorum), but also with absorbents and nerves, and have, in these respects, a similar organisation to the other soft parts of the body, they must be susceptible of every change to which living parts are subject in common; and hence, when they are injured, they inflame, and pour out coagulating lymph, by which the injury is sometimes repaired, or the tube permanently closed.* In short, the coats of arteries inflame, and pass through all the stages of adhesion, suppuration, or gangrene, in the same manner as the skin, a gland, or a muscle.†

---

* See Dr. Carswell's Elementary Forms of Disease; Fasciculus on Hemorrhage.

Surgeons formerly entertained various theories, concerning the process by which the hemorrhage from divided arteries was suppressed; but, as none of these seemed altogether satisfactory, the late Dr. Jones was led to undertake a series of interesting experiments, the results of which enabled him to give a more correct view of the subject; and from these investigations it appears that, when an artery of considerable size is *entirely divided*, the bleeding is stopped in the following manner:—An impetuous flow of blood, a sudden and forcible retraction of the artery within its sheath‡, and a slight contraction of its extremity, are the immediate and almost simultaneous effects of its division. The natural impulse, however, with which the blood is driven on, in some measure counteracts the retraction, and resists the contraction of the artery. The blood is effused in the cellular tissue, between the artery and its sheath, and, passing through that canal of the sheath which has been formed by the retraction of the artery, flows freely outward, or is extravasated in the surrounding cellular tissue, in proportion to the open or confined state of the external wound. The retracting artery leaves the internal surface of the sheath uneven, by lacerating or stretching the cellular fibres which connected them. These fibres entangle the blood as it flows; and thus the foundation is laid for the formation of a coagulum at the mouth of the artery, which is completed with the blood gradually adhering and coagulating around its internal surface, till it completely fills it up from the circumference to the centre.

The hemorrhage is checked by the effusion of blood into the surrounding cellular tissue, and between the artery and its sheath; but, particularly, by the diminished velocity of the circulation, occasioned by the bleeding, and by the quick manner in which the blood always coagulates, when the action of the vascular system is much diminished.

---

* See Jones on the Process employed by Nature in suppressing the Hemorrhage from Divided and Puncturated Arteries ; and on the Use of the Ligature ; with Obs. on Secondary Hemorrhage, p. 5. 8vo. Lond. 1805.

† Hodgson on the Diseases of Arteries and Veins, p. 1. 8vo. Lond. 1815..

‡ Arteries of the fourth and fifth orders, like those of the forearm and leg, are not furnished with a distinct sheath, the external coat being immediately connected with the surrounding cellulur tissue. This accounts for the greater difficulty, invariably experienced, in separating a small artery from its attachments than a large one. See P. J. Manec, Traite Theorique et Pratique de la Ligature des Arteres, p. 3. fol. Paris, 1832.

Thus a clot over the mouth of the artery, within its sheath, called by Dr. Jones, the *external coagulum*, presents the first complete barrier to the effusion of blood.

The mouth of the artery being no longer pervious, and having no collateral branch very near it, the blood, just within it, is at rest, coagulates, and forms, in general, a slender conical coagulum, which neither fills up the canal of the artery, nor adheres to its sides, except by a small portion of the circumference of its base, which lies near the extremity of the vessel. This coagulum is distinct from the former, and is named by Dr. Jones the *internal coagulum*.

In the mean time, the cut extremity of the artery inflames, and the vasa vasorum pour out fibrine, which is prevented from escaping by the external coagulum. This fibrine fills up the extremity of the artery, is situated between the internal and external coagula of blood, is somewhat intermingled with them, or adherent to them, and is firmly united all round to the internal coat of the artery.

The permanent suppression of the hemorrhage chiefly depends on this coagulum of fibrine; but, while it is forming within, the extremity of the artery is further secured by a gradual contraction, which it undergoes, and by an effusion of fibrine between its tunics, and in the cellular tissue surrounding it. Thus, these parts become thickened, and so completely incorporated with each other, that one cannot be distinguished from the other; the canal and mouth of the artery becoming obliterated, and blended with surrounding parts.

When the wound in the skin is not healed by the first intention, an exudation of cagulating lymph, or fibrine, gives a covering to the end of the vessel, and separates it from the cavity of the wound.

In the inferior portion of the divided artery, the orifice of the vessel is generally more contracted, and the external coagulum is much smaller.*

The extremity of the artery, up to the first collateral branch, afterwards gradually contracts, till at length its cavity is completely obliterated, and its tunics assume a ligamentous appearance.

The external coagulum, which stopped the hemorrhage in the first instance, is absorbed in a few days, and the thickening of the parts, from the extravasation of fibrine, gradually diminishes.

If the end of the artery be examined, at a still later' period, it will be found to be reduced to a mere filamentous state, as high up as the origin of its first branch, and the anastomosing branches are considerably enlarged.

---

* Mr. Guthrie differs from Dr. Jones, in believing the retraction and contraction of the lower end of a divided artery not to be so complete, nor so permanent, as in the upper. He states, also, that the internal coagulum is less perfectly formed. On the Diseases, &c. of Arteries, p. 249.

Another fact made out by Dr. Jones is, that, when the division of an artery has happened near a collateral branch, no internal coagulum is formed.

When an artery is *punctured* or only *partially divided*, the blood is effused in the cellular tissue, between the artery and its sheath, for some distance both below and above the wounded part. On examination, a short time after the hemorrhage has stopped, a stratum of coagulated blood is found between the artery and its sheath, extending from a few inches below the wounded part, to two or three inches above it, and is somewhat thicker, or more prominent, just over the wounded part, than elsewhere. In consequence of the space between the artery and sheath becoming filled with blood, and the latter part distended, the relative situations of the punctures in it and the artery are altered, and thus a coagulum of blood becomes confined by the sheath over the puncture in the vessel, and stops the hemorrhage. But this is only a temporary barrier; and the permanent stoppage of the bleeding is here also effected by a process of reparation or obliteration.

If an artery be wounded only to a moderate extent, it is capable of re-uniting, and of healing so completely, that, after a certain time, the cicatrisation cannot be discovered, either on its internal or external surface; and even oblique and transverse wounds (which are attended with more gaping than longitudinal ones,) when they do not open the artery to a greater extent than one fourth of its circumference, are also healed, so as to occasion little or no obstruction in the canal of the artery. But, as Petit observed, this can hardly ever happen, except when the aperture in the vessel is of moderate size*; and, as Professor Béclard's experiments tend to prove, it can scarcely take place in an artery above a certain magnitude, without the support afforded to the vessel by its sheath. In larger wounds, the artery is rendered impervious by the effusion and organisation of fibrine; and, when the division is still more extensive, the partially divided part of the vessel becomes either torn or ulcerated through.†

SURGICAL MEANS FOR THE STOPPAGE OF BLEEDING.

The *tourniquet* consists of a band and buckle, a pad, and two brass frames, the upper one of which is furnished with two small rollers, and the lower with four, over all of which the band plays, so as to facilitate the action of the screw. When the handle of this is turned to the right or left, the band is tightened, or relaxed, in the exact degree which the surgeon wishes. The piece of leather under the lower brass frame hinders the skin from being hurt at this point by the pressure of the edges of the hard metal. The buckle is prevented from having this effect by its being commonly fastened over the pad. The band is first buckled round the limb in such a manner, that the pad, which is attached to the band, is placed exactly over the artery. The two brass frames, with their respective rollers, over which the band proceeds, are then made to separate from each other to the requisite distance by turning the screw, and thus the due degree of pressure is produced.

---

* Mem. de l'Acad. Royale des Sciences, an. 1735.
† Jones, op. cit. chap. i. sect. 3. and chap. ii.

The advantages of this instrument are considerable: the pressure may be regulated with the utmost exactness, and it operates with the chief force on the point where the pad is placed, and under which the main artery lies; it does not require the aid of an assistant to keep it tense; it completely commands the flow of blood into a limb; it may be relaxed or tightened in a moment; and, when there is reason to fear a sudden renewal of bleeding, it may be left slackly round a limb, and, in case of need, made tense in an instant.

Its operation, however, is limited to the limbs; and, as the pressure, necessary to impede the flow of blood through the principal artery, completely prevents the return of blood through the veins, its application cannot be made long without inducing gangrene. Hence, it is only a temporary expedient for the stoppage of bleeding, always discontinued immediately the surgeon has had time to adopt other means of a more permanent nature.

The tourniquet is unquestionably a meritorious invention, by which the lives of wounded persons are frequently preserved, and a degree of security given to several of the most important operations in surgery, sometimes difficultly attainable without its assistance. Thus, when surgeons are about to amputate a limb, they commonly apply the tourniquet, in order that the patient may not lose a dangerous quantity of blood during the time requisite for the division of the soft parts and the sawing of the bone. These proceedings having been completed, the principal artery or arteries are looked for, the situations of which are made known by anatomy. For instance, in the stump of an amputated thigh, the operator searches for the open mouth of the divided femoral artery near the sartorius muscle: he takes hold of it with a pair of arterial forceps, and the assistant ties it. But, after having taken up the main artery and such others as have determinate situations, and are large and open-mouthed, so as to be readily perceived, the surgeon would not be able to detect others of less size, requiring ligature, if the tourniquet were not loosened for an instant, when the gush of blood from particular points denotes where they lie. Directly the surgeon has gained this information, he tightens the tourniquet again, seizes the end of one of the bleeding vessels with a tenaculum, and the ligature is applied.

Supposing a person were to meet with a wound of one of the principal arteries of the upper or lower extremity, followed by profuse hemorrhage, here the surgeon would immediately put on the tourniquet, and stop further loss of blood, until he had had time to adopt the requisite measures for securing the wounded artery.

Important as the tourniquet certainly is, it is only applicable to the limbs; and even there its office may be partly executed by a steady assistant making pressure on the main artery with his hand, or some other compressing instrument. In University College Hospital, the tourniquet is not usually employed in amputation; the current of blood through the main artery of the limb being commanded by pressure made with the fingers of a trusty assistant. The objection made to the instrument in such operation is, that it renders all the veins of the limb exceedingly turgid, and that more blood is lost than when the pressure is made on the artery alone with the fingers. The tourniquet is also, as I have stated, only a temporary expedient, because its application beyond a certain time would bring on mortification. Hence, it is absolutely necessary to employ other means as soon as possible.

Ligature. With all the knowledge which we now possess about the right principles of treating wounded arteries, and advantageous as the tourniquet sometimes is, we could more conveniently dispense with its assistance than with that of the means which I am next going to consider; namely, the *ligature.* A modern surgeon, possessing coolness and anatomical knowledge, would know how to prevent the patient from being lost by hemorrhage from any part of the body, to which that instrument is applicable, even were he not provided with it. He would know how and where to make pressure on the arterial trunk; and, if the wound were so ample as to let the orifice of the bleeding artery be seen, he would then have recourse to the simple and effectual plan of placing his finger over it, until he could get out his case of instruments and tie it. I have known practitioners so confused as to let patients lose a fatal quantity of blood in their presence, from the neglect of this obvious and simple proceeding.

It is not doubted at the present day, that the most important of the means for the permanent stoppage of bleeding is the *ligature*, by which the most alarming bleedings may be restrained. With this the mouths of the divided arteries are tied, and thus, not only an instantaneous stop is put to further hemorrhage, but, long before the ligature becomes loose, the opposite sides of the vessel have grown together, and all danger of the renewal of the bleeding is over.

Several of the conclusions, drawn from Dr. Jones's experiments upon the subject of hemorrhage, are of the highest importance in relation to the practice of surgery, and, were they all of them universally admitted, little doubt would remain about the most advantageous manner of making and applying ligatures. That a ligature, especially a small one, when applied round an artery with a certain degree of tightness, completely divides the inner and middle coats of the vessel, is a fact well known to all surgeons; but, whether we should employ such ligatures as are expressly calculated to produce this effect, and whether we should aim at it as a beneficial and useful, not to say an essential, object, are questions on which there have been, and perhaps still are, differences of opinion. From a variety of experiments Dr. Jones was led to infer, that the division of the membranous and muscular coats of a tied artery by the ligature had a principal share in bringing on the effusion of fibrine within the vessel, or, in other words, the process of adhesive inflammation, by which the permanent closure of the vessel was effected. He observes that, when a ligature is properly applied, it cuts through the internal and middle coats of the artery, keeps their cut surfaces in contact, and affords them an opportunity of uniting and cicatrising, as other cut surfaces do, by the adhesive inflammation. Nay, he extended the doctrine further, by representing the division of internal coats of the vessel by the ligature, not merely as advantageous, but as absolutely indispensable; for he remarks that, if the ligature does not completely cut through the internal and middle coats all round the artery, adhesion cannot take place between its internal surfaces, and, therefore, secondary hemorrhage will take place, as soon as the ligature has ulcerated through any part of the artery.[*]

That Dr. Jones erred, in describing the division of the inner coats of the vessel as a thing without which the vessel could not be closed by the process of adhesive inflammation, remains no longer questionable. The assertion, as Sir Phillip Crampton[†] has observed, rested upon no other foundation than several experiments made on the arteries of quadrupeds, in *all of which* the internal and middle coats were ruptured by the application of the ligature. No comparative experiments are related, in order to show, that this operation of the ligature is essential to the process of union, and that, under these circumstances only, the obliteration of the artery can take place. Numerous instances are recorded of arteries being obliterated by the pressure of tumors. The subclavian and carotid have been found obliterated by the pressure of an aneurism of the arch of the aorta.[‡] In Mr. Freer's experiments, the pressure of a tourniquet for four days was sufficient to effect the obliteration of the radial artery in horses.[§] Mr. Hunter found, that the mere exposure of the tibial artery of a dog to the air, for about an hour, excited such a degree of inflammation and thickening of its coats as completely obstructed the canal.[||] All the great arteries, the aorta inclusive, have been found obliterated, in consequence of the effusion of fibrine from their internal coat, and this independently of any injury which could produce rupture of that membrane. The cure of aneurism by compression (whether mediate or immediate) affords an example of the obliteration of an artery without any rupture of its internal coats.[*]

---

[*] On Hemorrhage, pp. 166. and 170.

[†] Medico-Chir. Trans. Vol. vii. p. 348.

[‡] Hodgson on the Diseases of Arteries and Veins, p. 110. A. Cooper, in Med. Chir. Trans. vol. i. p. 12.

[§] Obs. on Aneurism, p. 14.

[||] On the Blood, &c.

In the course of the interesting experiments undertaken by Dr. Jones, he observed, that when a ligature had been tightly applied round a large unwounded artery in a quadruped, so as to cut through the internal coats, and it was immediately afterwards removed, the adhesive inflammation took place at the part of the vessel embraced by the ligature, and the canal of the artery became permanently obliterated for some extent. This consequence happened, however, with increased certainty, when two or more ligatures were thus applied near one another, and then taken off.[†]

The promulgation of these observations at first excited hopes, that the leaving of a ligature on arteries, tied for the cure of aneurisms, might be dispensed with; and what Dr. Jones had himself succeeded in accomplishing did not fail to convince him, still more firmly, that the division of the inner coats of the artery was the main exciting cause of the adhesive inflammation by which the canal of the vessel was permanently closed; and that the obliteration could not happen unless those coats were cut through by the ligature. But, as Mr. Traverse has justly stated, the result of these experiments neither warranted the conclusion that the complete division of the internal coat was necessary to union, nor that union was a necessary consequence of it. The history of the broad tape or ribband ligature proves, that contact without wound will sometimes produce adhesion, and the frequent repetition of Dr. Jones's experiment has proved that wound without contact will sometimes fail to produce it. Mr. Dalrymple, of Norwich, repeated the second experiment, in Dr. Jones's third chapter, not less than seven times on horses, and three times on sheep, and, in every instance, failed in obtaining the same results. Not only was no coagulum formed, but, even when the animal had been suffered to live until the thirteenth, fifteenth, or eighteenth day after the operation, the canal of the artery was not found obliterated. Its calibre was indeed contracted; but the tube remained in some degree pervious, and capable of transmitting a lessened column of blood.[‡] The evidence of another eminent writer also coincides precisely with that of Mr. Dalrymple.[§]

Dr. Jones's idea, that the division of the internal and middle coats was essential to the production of the requisite degree of adhesive inflammation for the obliteration of the cavity of the artery, is completely refuted, not only by the facts adverted to by the preceding authors, but by a variety of other considerations. A ligature was put round the carotid of a dog without being drawn. It lay in contact with the artery, but did not press upon it, nor interrupt the flow of blood through it. The result was an obliteration of that part of the vessel which was irritated by the presence of the ligature. The same experiment was made on the carotid of an ass with a similar consequence.[*] Here, then, are further proofs, as unequivocal as any of those previously cited from Sir Philip Crampton's valuable paper, that the internal coat of an artery will effuse fibrine when any cause of sufficient iritation exists on the outside of the vessel, and that the division of its inner coats by a ligature is by no means essential to the excitement of the adhesive inflammation within it.[†]

---

[*] Crampton, in Med. Chir. Trans. vol. vii. p. 345.

[†] Jones on Hemorrhage, p. 126, &c.

[‡] Travers, in Med. Chir. Trans. vol. iv. p. 442.

[§] Hodgson on Diseases of Arteries, &c. p. 128.

All serous membranes, including the inner coat of the arteries, when kept in close contact, in sufficiently vigorous subjects, generally assume, with surprising quickness, the adhesive inflammation in the seat of the compression and around it, evincing a singular propensity to effuse fibrine, and, though such membranes are inflamed, they remain free from ulceration or breach of continuity. This is daily seen between the lungs and pleura, between the peritoneum and the viscera of the abdomen, and between the tunica vaginalis and the testicle. And, in order to assure ourselves that the same phenomenon also happens betwixt the two opposite sides of an artery, which are simply held in close contact with each other, without any previous ulceration or rupture of them, we need not have recourse to analogy in what takes place under the same circumstance in other similar parts of the body, since there are numerous instances of the quick union and perfect closure of an artery, by means of the adhesive inflammation, under simple compression alone, practiced upon the artery while all its parts remain entire. Dubois[‡] effected this prompt adhesion by means of the serrenœud of Desault; Assalini[§] by compressing the artery with his forseps; and Crampton with a presse-artére resembling that of Deschamps. To these facts we are to add numerous others of the closure of the artery, in consequence of pressure made on the vessel by a neighboring tumor, or an aneurismal sac. If the ligature be peferable to compression in the treatment of external aneurism, still it is certain that, by means of pressure applied above the seat of the disease, several cures have been accomplished; and if the compressing apparatus does not always produce such good effects, it is often because we have not the opportunity of making the pressure with sufficient steadiness and force to obliterate the artery. Compression (says Scarpa) generally answers very well when made upon an exposed artery, behind which there is a point of resistance. Formy[*], in a wound of the brachial artery, laid bare the vessel, placed a cylinder of linen upon it, and over this some graduated compresses, supported by means of a suitable bandage; and thus he effected the closure of the artery[†]. Guattani exposed the femoral artery as it passes under Poupart's ligament, compressed it against the ramus of the os pubis with graduated little bolsters and a bandage, and the vessel was speedily closed. Flajani[‡], in similar cases, found the same method answer. Buzani[§] also succeeded, with graduated compresses, in healing a wound on the brachial artery after bleeding; and so did Garneri in two additional examples of the same nature. Scarpa corroborates the purport of these observations by a relation of some experiments, in which the arteries of sheep and other quadrupeds were tied with a simple ligature, and also with a ligature between which and the vessels a roll of waxed linen was placed, in order to prevent the inner coats from being cut through. The main result was, that in all these cases, the artery closed, but the ulceration advanced more quickly in the instances where the simple ligature was used.[¶] Four cases are likewise recorded, in which Scarpa's mode of applying the ligature was successfully practised in operations for aneurism.

---

[*] C. Bell, Surgical Obs. vol. i. p. 261.

[†] See, also, Crompton's experiments with a flat ligatur, and piece of metal, on the carotids of sheep, in Med. Chir. Trans. vol. vii. p. 846., and other experiments detailed by Scarpa in his Memoria sulla Legatura delle principali Arterie degli Arti, &c. Fol. Pavia, 1817. p. 84. et seq.

[‡] Leveille, Nouvelle Doctrine Chir. t. iv. pp. 247—280,

[§] Manuale di Chirurgia,

The preceding facts cannot allow us to hesitate a moment about the rejection of Dr. Jones's assertion, that a ligature will never be followed by an efficient degree of adhesive inflammation within a tied artery, unless the inner coats of the vessel be divided by the cord. Instead of so sweeping an inference, this talented observer should merely have concluded, that such inflammation may take place after the ligature has had the effect described, and not that it cannot happen under any other circumstances. The determination of this question, however, is not at all a decision of the other point, viz. whether such division of the inner coats of an artery by the ligature be useful or detrimental in its effects upon the process by which the vessel is to be obliterated. Dr. Jones, who considered it as the best means of promoting the effusion of coagulating lymph, or fibrine, within the vessel, and as the surest and most prompt mode of bringing about the union and closure of the tied part of the arterial canal, gave a decided preference to small ligatures, which always cut through the inner coats of the vessel with the greatest certainty. He thinks that ligatures should be round and very firm; and he declares, that there is no danger of their making the external coat of the artery ulcerate, by their tightness, before the internal ones have adhered; for the union of the latter is found to be soon completed. He reprobates broad flat ligatures, because they cannot be tied smoothly round the artery, which must become puckered, and, consequently, have an irregular bruised wound made in its middle and internal coats. By covering a considerable part of the external surface of the artery, they may also destroy the very vessels which pass on it in their way to the cut surfaces of the internal and middle coats, and thereby render these surfaces incapable of inflaming. But, says he, admitting that such a ligature makes a proper wound, and that the wound unites, still it may cover that part, of the external coat which is directly over the newly united part, and, consequently, as soon as it has occasioned ulceration through the external coat, it will produce the same effect on the newly united parts, and, of course, secondary hemorrhage. A ligature of an irregular form will not cut through the inner coats of the artery equally at every point, which Dr. Jones endeavors to prove ought to be done, for the purpose of occasioning an effusion of fibrine and adhesion. The first good explanation was likewise given by him of the advantages of applying ligatures in as circular a manner as possible, not higher on one side of the vessel than the other. Any deviation from a circle must be unfavorable to a steady apposition of the cut surfaces of the artery, and be conducive to secondary hemorrhage.

---

[*] Traite Chir. des Bandes Larges Emplatres, &c. Montpelier, 1652.

[†] De Aneurysmate, Historia 15.

[‡] Collezione d'Osservasioni e Riflessioni di Chirurgia, t. ii. p. 47, &c.

[§] Opere di Bertrandi. Trattato del Operaz. t. iii. p. 207. Gli editori.]

[¶] Memoria sulla Legatura, &c. pp. 27. 84, &c.

Sir Philip Crampton, however, is far from admitting the utility of cutting through the internal coats of the artery with the ligature, and is of opinion that, in man, the division of these coats not unfrequently prevents the obliteration of the artery, and gives rise to secondary hemorrhage; two assertions which appear to me not to be very well proved. If it be meant to draw a weighty argument from the weakening of the artery by this effect of the ligature, and an apprehension of the vessel bursting, or becoming dilated, how can we give such importance to this mode of reasoning, when such inability of the remaining external coat to resist the impetus of the circulation must be very rare? Although the two middle coats are divided by the ligature, in securing the vessels in the common way after every operation, I have never seen an artery give way or become dilated from this sort of cause. I have known the ligature slip from not having been skilfully applied, or accidentally pulled off by a jerk of the hand, and a hemorrhage take place. An artery may also be in so diseased a state as to give way at once under the application of the ligature; or, if it should not burst immediately, yet, from being incapable of the adhesive inflammation, it may afterwards pour out its blood as soon as the ligature has produced ulceration through the external coat. But, in this circumstance, it is evident, as Scarpa himself allows[*], that no mode of tying the vessel will answer. As we are not sufficiently acquainted with the actual state of the vessels, the kind of ligatures employed, and some other essential particulars, in the few cases cited by Sir Philip Crampton, with the view of proving the risk of arteries giving way from their inner coats being cut through by the cord, we cannot pronounce whether these were really examples of this injurious operation of the ligature, or whether they might not rather be specimens of some uncommon diseased state of the arteries. For my own part, I cannot suppose any instance in which the brachial artery, after being tied in amputation, would three times form an aneurismal tumor above the ligatures[†], if it were not in some unusual state of disease, because I have seen many hundreds of amputations, but have never witnessed such an occurrence. Besides, if this particular case prove any thing, it proves, at all events, that the largish ligatures used in Warner's time, which ligatures probably never fairly divided the inner coats of a sound artery, could not prevent the vessel in question from giving way. Without extending these criticisms, however, I may safely assert, that the advocates for the utility of cutting through the inner coats of the vessel, and the employment of small fine ligatures, will come off triumphantly, if they only encounter such objections as are founded upon the danger of the artery at once giving way, or forming an aneurismal tumor. It avails little to talk, as Scarpa has done, of the arteries of some individuals being of preternaturally weak texture from birth[‡]; or to urge, with Sir Charles Bell, that, if a dead artery be tied too tightly, it will burst at the tied part when distended with anatomical injection.[§] The question can never be decided by such statements; and when we admit, with these writers, that an artery with three unbroken coats is physically stronger than when two of these coats are broken or torn, we still maintain, that the remaining external coat is strong enough to resist the impetus of the circulations, so far as we can judge from the general result of the practice, in which it is the surgeon's particular aim to cut through the inner coats of arteries in applying the ligature. It matters not what happens in the injection of dead bodies; what happens in aneurismal and diseased arteries before the ligature is employed; what may have happened in very unusual cases, showing that ligatures may sometimes fail: it must be proved, that the tying of arteries, on the principles recommended by Dr. Jones, is generally less successful than other plans.

---

[*] Memoria sulla Legatura delle Principali Arterie, p. 7.

[†] See Warner's Cases in Surgery, p. 178. Probably the inner coats of the artery were in this case not divided, because the vessel was secured with a needle and ligature, and of course an intervening portion of flesh included. Mr. Warner himself entitles the case "An *Extraordinary* Disease of the Humeral Artery."

[‡] Memoria sulla Legatura delle Principali Arterie degli Arti, p. 25.

[§] Surgical Obs. vol. i. p. 260.

Amongst the most distinguished surgeons who opposed the doctrines and practice recommended by Dr. Jones, and so extensively approved of in this country, was Scarpa, whose valuable observations on many parts of anatomy and surgery rendered him the pride of the modern Italian school. After briefly describing the process of obliteration, according to Dr. Jones's account, and mentioning a few other things, to which I have already adverted, he argues that, as cutting through the internal coats of an artery must render the vessel weaker than when its coats are left undivided, and we can never estimate the destiny of such a vessel in the living subject, it is, cæteris paribus, better to tie the vessel in such a way as will leave all its three coats uninjured. When the internal coat is ulcerated from internal causes, and the adhesive inflammation does not supervene quickly enough, he says, the blood is invariably effused through the layers of the middle tunic, and extravasated on the outside of it, first in the form of ecchymosis, and afterwards in that of an aneurismal swelling. Now, if this can happen when only the inner coat is ulcerated, it must still more easily take place when the middle coat is also divided, and any cause retards the adhesive inflammation. He admits that, even in this second case, if, directly after the division of the two internal coats, the artery is affected with the requisite degree of adhesive inflammation, as fortunately mostly happens, the union and closure of the vessel follow as speedily and favorably as if the two inner coats had not been divided. But he declares, that this fortunate issue is not constant, especially in man, in whom the adhesive inflammation is not, as it is in brutes, sufficiently quick to produce on the coats of the artery its beneficial effects immediately after the application of a tight ligature. Yet, while the adhesive inflammation is thus retarded, the ulcerative process, occasioned by the pressure of the small ligature, rapidly attacks the external cellular coat of the artery, eats more and more deeply into it, and penetrates into the cavity of the vessel before this has been rendered impervious, and certainly with greater celerity than if it had to make its way through all the three tunics of which the artery is composed. The slow access of the adhesive inflammation, whether from the general debility of the patient, or from the particular state of the artery itself, is not followed by a proportionate retardation of ulceration, which incessantly proceeds till it gives rise to the worst effects. Besides, it is contended that, in feeble subjects, the coagulating lymph effused in the cavity of the artery, as well as the coagulum itself, sometimes does not acquire with equal celerity the degree of consistence necessary for firmly connecting together the opposite sides of the artery, which are held in accurate contact. These dangers, says Scarpa, are unquestionably avoided by keeping all the three coats of the artery from being injured by the pressure of the ligature.*

But, after all this reasoning, we must return to experience; and, if Sir Philip Crampton and Professor Scarpa have produced cases, exemplifying the possibility of effecting the obliteration of arteries without a division of the inner coats of the vessels, as I admit has been fully proved, they cannot subvert the fact, acknowledged by all the most experienced surgeons in this metropolis, that since Dr. Jones's principles have been acted upon in practice, and small ligatures been employed, secondary hemorrhage has become much less common. Those principles dictate the use of a fine ligature, as first tried on the human subject by Dr. Veitch, in the Naval Hospital at Plymouth, and prohibit all unnecessary disturbance and irritation of the artery; all needless separation of it from its surrounding connections; and, in particular, forbid the introduction of a larger quantity of extraneous substances into the wound than the indications positively require. If the increased success, to which I have alluded, be the truth, it is an answer to every argument used by the opponents of Dr. Jones's Doctrines. With respect to the danger of the external coat being ulcerated through more quickly by a ligature, which divides the other two coats, as this occurrence will enable the surgeon to remove the extraneous substance sooner, it must be a great advantage, if it be also a fact, as experience proves, that such division of the inner coats expedites the adhesive inflammation, and insures the closure of the vessel, before the ulceration has penetrated through the external tunic.

Dr. Jones refutes the idea of ligatures being forced off the vessels by the impulse of the circulation; a fear, which led to very hurtful practices, with the view of mechanically fixing the ligature; and he observes, that a candid inquirer into the cause of it will find a much more rational explanation, either in the clumsiness of the ligature, which prevented its lying compactly and securely round the artery; or in its not having been applied tight enough, lest it should cut through the coats of the artery too soon; or in its having that very insecure hold of the vessel, which the deviation from the circular application must necessarily occasion.

No other plan of preventing bleeding from large arteries is so safe as the ligature, because no other makes such direct pressure on them, nor acts with so little chance of being displaced. In the performance of operations, large arteries are often wounded in situations where the tourniquet cannot be applied. The scientific surgeon now knows, that he can tie such vessels immediately they are wounded, and then proceed with his incisions, without that confusion and danger which would result from the continuance of a profuse hemorrhage during the whole time requisite for the completion of the operation.

---

* Memoria sulla Legatura delle Principali Arterie, pp. 26—28.

It is a maxim in surgery always to tie arteries as separately as possible, that is to say, without any nerve, vein, or portion of flesh being included in the noose of the ligature. The tying of the flesh should constantly be avoided when possible, because it produces immense pain, and causes a larger part of the wound to remain disunited. Ligatures, thus awkwardly applied, are likely to become loose, as soon as the substance between them and the arteries sloughs; or they may form a circular furrow in the textures surrounding the vessels, and remain, a tedious time, incapable of being removed. The intervention of any substance between the ligature and the artery must also have a great tendency to prevent the internal coats of the vessels from being cut through; that very event, on which the safety from secondary hermorrhage is found so much to depend.

Bloodvessels partake of the same organisation as other parts. Hence the healing of a wounded artery can only take place favorably, when that part of the vessel which is immediately contiguous to the ligature continues to receive a due supply of blood through its vasa vasorum. As these vessels are derived from the surrounding ramifications, it is obvious that the application of a ligature to a divided artery at some distance from where it is encompassed by flesh, must be very disadvantageous and insecure. Thus, although it is quite improper to include much of the adjacent soft parts with the artery in the ligature, it is highly judicious to make the knot as closely as possible to that part of the vessel which lies undisturbed among its natural connections. These observations, however, only refer to vessels above a certain size; for others are not sufficiently visible to be tied in this manner.

The method of tying an artery is as follows:—The extremity of the vessel is first to be taken hold of by the surgeon with a tenaculum, or pair of artery forceps, which open by their own elasticity, and are sometimes so constructed as to admit of being kept closely shut with a double button, that slides along a slit in each branch of the instrument. When the vessel is large and obvious, the forceps should always be preferred. A round firm ligature, and by no means too thick, is then to be put by an assistant, in the form of a noose, round the artery, just below the end of the instrument. The same assistant then tightens the noose; and, in order that it may not rise above the mouth of the artery, he draws the ends of the ligature as horizontally as possible, which is most conveniently done with the thumbs. A knot is next made. Assalini's double spring tenaculum, which shuts in the manner of a pair of forceps, is now preferred, by many of thebest hospital surgeons in the country, to the common tenaculum.

When the wounded artery is large, one ligature to the orifice nearest the heart will not suffice; for, as soon as this is tied, the blood finds its way, through anastomosing branches, into the lower continuation of the vessel, the further orifice of which from the heart then begins to bleed.

The lower or distal end of a divided artery is believed to be more prone to secondary hemorrhage, than the upper; and, according to Mr. Guthrie, this is so much the case that, if the bleeding has been arrested for four hours, and then returns, it is in all probability from the lower end. "This," says he, "may always be known from the darker color of the blood, and from its flowing out in a continuous stream, in the same manner as water rises from a spring, and not with any arterial impulse."[*] When the anastomoses are very free, as in the lower part of the forearm, the blood issues from the lower end of the artery directly the upper one is secured; or, more properly speaking, it never ceases to pour out blood in small quantity, which is of a bright red, or vermillion color. On the contrary, when the blood has to pervade the capillaries, ere it reaches the lower continuation of the artery, it flows out evenly, that is to say, not *per saltum* , and presents a dark color, and the appearance of venous blood.[†] After a time, however, when the anastomosing communications between the upper and lower portions of the vessels have become more direct and free, the blood from the distal orifice, if secondary hemorrhage occurs, will exhibit the usual scarlet color of arterial blood. In hemorrhage from individuals who are in a state approaching to asphyxia, the blood issuing even from the cardiac end of an artery will not retain its characteristic redness.

When a large artery is only punctured, and not completely cut through, the vessel is to be first exposed by an incision, and a double ligature put under it by means of an aneurism needle. One portion of the ligature is then to be applied above the wound in the artery; the other below it. Thus, all danger of bleeding, from the passage of the blood by the anastomoses into the lower part of the vessel, is effectually removed.

Sometimes, when the punctured part of the artery cannot be prudently exposed by an incision, as in a bleeding from one of the deep-seated arteries of the leg in a compound fracture, or from a wound that is highly inflamed, and threatening gangrene, the surgeon should cut down to the vessel in a situation nearer the heart, and be content with the application of one ligature. On these principles it was, that in a gun-shot wound, injuring the popliteal artery, I took up the femoral artery in 1814, and in University College Hospital, in May 1835, I tied the popliteal artery, on account of several returns of bleeding from the arteries of the leg; and, in both these cases, the plan answered very effectually; yet the safest general rule is, undoubtedly, to expose the wounded part of an artery, and tie it above and below the aperture from which the blood issues.

---

[*] See Guthrie on the Diseases and Injuries of Arteries, p. 248.

[†] See L. J. Sahson des Hemorrhagies, Tramatiques Paris, p. 82, 8vo. 1836.

Since ligatures act as extraneous substances, and only one half of each is necessary for withdrawing it when it becomes loose, the other half is always to be cut off near the knot.

With the view of diminishing still further the quantity of extraneous substance in the wound, the plan of cutting off both ends of the ligature close to the knot was proposed by Mr. Lawrence; but this method is not generally followed, in consequence of the small portions of ligature left in the part having sometimes occasioned a succession of troublesome abscesses.[*] When, however, the wound must suppurate, the practice is free from objection, and the best ligatures for this purpose are very fine ones, composed of dentists' silk.[†]

Ligatures usually separate, even from the largest arteries ever tied, in about a fortnight or three weeks, and from smaller ones in the course of five or six days. When they continue attached beyond the usual period, it is proper to draw or rather twist them gently every time the wound is dressed, so as to accelerate their separation.

Compression. When the blood does not issue from any distinct large vessels, but from numerous small ones, compression is preferable to the ligature, the employment of which would render it necessary to tie the whole surface of the wound. In order to make effectual compression, the opposite surfaces of the wound are to be brought into contact; compresses are then to be placed over it, and a roller applied with moderate tightness.

If compression can ever be safely adopted as a permanent plan for bleedings from large arteries, it is when these vessels run in the vicinity of a bone, against which they can be compressed; as in bleeding from the temporal artery. Compression is sometimes tried when the brachial artery has been wounded in phlebotomy. Here it is occasionally tried in preference to the ligature, because the latter cannot be employed without an operation to expose the artery. It is absurd to adopt compression, in this instance, with an idea that it brings about the closure of the wound in the vessel without obliterating the arterial canal; and, consequently, with less chance of mortification from a deficiency of blood in the limb. Frequent dissections have proved that, whenever a large artery has been wounded and healed by pressure, the canal of the vessel rarely continues pervious; for although Dr. Jones's experiments, as well as those of Béclard, tend to show, that an artery, very partially divided, may heal and remain pervious, the latter condition is not to be expected, when much compression is employed.

---

[*] Guthrie on Gunshot Wounds of the Extremities, p. 93. See also Crosse's Obs. in Lond. Med. Repository, vol. vii. p. 363., and Gibson's Institutes, &c., of Surgery, vol. i. p. 72.

[†] Lawrence, in Medico-Chir. Trans. vol. viii. p. 490.

When an artery of magnitude has received a small wound, and lies favorably for the trial of pressure, either the ring-tourniquet or the following plan may be tried :—I suppose the brachial artery at the bend of the elbow to be the vessel. A tourniquet is to be applied, so as to command the flow of blood into the vessel. The edges of the external wound are next to be brought into contact. Then a compress, shaped like a blunt cone, and formed of a series of compresses gradually increasing in size, is to be placed with its apex exactly over the wound in the artery. This gradual compress, as it termed, is then to be bound on the part with a roller. After relaxing the tourniquet, if no blood escape, the surgeon should feel the pulse at the wrist, in order to ascertain that the compression employed is not so powerful as entirely to prevent the circulation. The arm is to be kept perfectly quiet in a sling ; and in forty-eight hours, if no bleeding take place, there will be great reason to expect that the case will end well. The plan would not, I think, be likely to succeed, if there were much blood already effused in the cellular tissue, because this would prevent the compress from acting efficiently on the wounded part of the artery.

In a wound of the superficial palmar arch, the ends of the artery may sometimes be tied at first without much difficulty, if the wound in the skin and fascia be properly enlarged. Were the attempt to fail, or were the wound itself a mere puncture, a graduated compress on the part, and cold applications, might be resorted to with success, as I have seen in several examples. Sir Astley Cooper informs me that, in some cases of puncture of the superficial palmar arch, dividing the artery completely through, so as to allow the ends to retract and contract, has effectually put a stop to the bleeding. I have never seen a case in which the ligature of the brachial artery was required for bleeding from the palmar arches; but, at least, half a dozen, where the radial or ulnar was taken up, and cold and a graduated compress also resorted to. In every instance, the effect of pressure on the radial and ulnar artery should be ascertained. When hemorrhage takes place from the palmar arches, in gunshot injuries of the hand, the bleeding orifices can rarely be secured by ligature. Here, graduated compresses on the radial and ulnar arteries at the wrist, and on the bleeding part itself, aided by a cold evaporating lotion, with which the had and forearm should be covered, will generally answer. When the hemorrhage is secondary, and the hand in a state that will not bear any degree even of regulated and limited pressure, the effect of ring tourniquet, in moderating or stopping the flow of blood through the brachial artery, should be tried. The operation of tying the brachial artery, or of mutilating the hand by removing one of the metarcarpal bones to search for the deep palmar arch, I consider unadvisable proceedings.

Compression can seldom be relied upon; for the compresses frequently slip off the artery, or the bandages become slack, so as to give room for fatal hemorrhage. When the plan is employed, a slack tourniquet may be left on the limb, ready to be tightened in an instant by a vigilant attendant left for that purpose. If the external wound heal, while the aperture in the artery remains unclosed, an aneurism will be the consequence. This is likely to happen when the pressure is not powerful enough; and, when it is too great, there will be risk of mortification.

When the mouth of a large artery, divided in amputation, or other free and open wound, can be taken hold of with the finger and thumb, a slight degree of compression made with them will stop the hemorrhage from it, until some means of permanently suppressing it has been put in execution. Or if the orifice of the artery, which may not project sufficiently for this purpose, be yet close to the surface of the stump or wound, a very moderate pressure, made perpendicularly on it with the end of a finger, will prevent loss of blood, until the surgeon is ready to secure the vessel with the ligature.

Many secondary hemorrhages may be restrained by moderate pressure, and a ligature should only be had recourse to when pressure is inapplicable, or ineffectual.* Such pressure is sometimes required to be placed directly on the bleeding vessels, but occasionally on the trunk from which they originate, through the medium of a ring tourniquet, or compress skilfully applied. By means of such a tourniquet applied to the femoral artery, bleeding from the tibial arteries in compound fractures has often been successfully commanded; and the same instrument, as we learn from Mr. Tyrrell, has proved very effectual in several instances, at St. Thomas's Hospital, where the brachial artery had been wounded at the bend of the elbow.

Sponge. In profuse hemorrhages after the operations about the rectum, or from the socket of a tooth, from the wound of lithotomy, or from the nose, sponge is sometimes employed for the purpose of checking the loss of blood. Its quality of expanding, when moistened, so as to distend and press upon the sides of any cavity in which it is placed, renders it eligible in these and a few other cases, where the bleeding vessels cannot be easily commanded by ligature.

Actual cautery. The application of a heated iron to a bleeding vessel is one of the most ancient modes of suppressing hemorrhage; but, at present, almost in general disuse. It operates by producing a slough, which covers and closes the mouth of the artery. In order that it may not injure the circumjacent parts, it is applied through a cannula.

---

* See G. J. Guthrie on Diseases and Injuries of Arteries, p. 166.

There are several objections to its employment: one is, that it does not regularly produce a permanent cessation of hemorrhage, as, when the eschar separates prematurely, the bleeding recurs.

In dangerous bleeding from the tongue†, and other parts within the mouth; and, perhaps, for the suppression of those profuse hemorrhages which sometimes arise from the bursting of varices, and aneurisms by anastomosis, the employment of the actual cautery may be warrantable. Dr. Elliotson recites a case, where the bleeding from the bites of leeches would have proved fatal, had they not been touched with the actual cautery. I should say, however, that nothing, but urgent necessity, can justify its use, and that, if the bleeding could be stopped by any other measures, they should be preferred.

Torsion of arteries. When limbs are torn off, or when wounds occur with much contusion and laceration, the middle and internal coats of the arteries are torn, and thrown into folds within the cellular tunic, which remains entire. Under these circumstances, large arteries frequently do not bleed, and then no ligatures are necessary. Probably, it was the recollection of this fact, which led MM. Amussat, Velpeau, and Thierry, three French surgeons, to try the experiment of stopping hemorrhage by twisting and stretching the extremities of the arteries, which they accomplished with forceps made expressly for the purpose.

Thierry simply twists the end of the artery with a pair of forceps, five or six times, if the vessel be small; and ten or twelve times, if it be large. Amussat first seizes the artery with one pair of forceps, and draws it out of the wound, with a view of separating it from the adjoining veins and nerves. Then, with another pair of forceps, he takes hold of the artery, below the grasp of the first forceps, pinching the vessel forcibly, so as to produce a solution of continuity in its internal and middle coats. Having done this, he holds the first pair of forceps firmly, and pushes the second ones, tightly closed, towards the undenuded part of the artery. This latter movement has the effect of pushing in that direction the inner coats, which are thrown into a fold or duplicature, which makes a sort of barrier against the stream of blood. Then holding the second pair of forceps stationary, he twists the end of the artery, now consisting of only the cellular coat, five or six times round with the first pair of forceps.

The torsion of arteries has not yet gained many advocates in this country. If we look over the cases published by Amussat himself, and consider the experiments and reports on the subject collected by Manec, we shall find, that the plan is not a security against hemorrhage at all equal to the ligature, and that the accomplishment of it is more tedious and painful than simply tying an artery. These reasons alone would induce us to reject the practice, even if the wound sometimes healed more quickly in consequence of their being seemingly no extraneous substance in it. But, the fact is, what M. Manec has recorded, namely, the wound is generally longer in healing, and suppurates more copiously; and, as the artery often sloughs, there is in reality an extraneous substance present, namely, the though itself. Hence, we cannot wonder, that Velpeau has already renounced the method.

---

† In Alibert's Nosologie Naturelle, tom. i., is described an amputation of the tongue, where the bleeding from three large arteries was instantly and effectually stopped by touching them with the cautery.

Potential cautery or caustic. The most common formerly used, was a button of the sulphate of copper, of the size of a pea, rolled up in a piece of linen, and placed on the aperture of the bleeding vessel. The operation of strong caustics is similar to that of heated irons. Caustics are even worse than the actual cautery; for their action is more tedious, less effectual, and not confined to the vessel alone. In a case recorded by Pelletan, inflammation of the dura mater and death were produced by muriate of antimony applied to a bleeding tumor on the head.*

Styptics are alleged to have the propriety of producing a contraction of the vessels, and, as is sometimes erroneously supposed, a quick coagulation of the blood. Such are cold air, cold water, wine, brandy, tincture of myrrh, spirits in general, diluted mineral acids, solutions of alum, sulphate of copper, &c. These substances do, indeed, possess the power of stopping a few hemorrhages from small vessels; but, they ought never to be trusted, when large arteries are concerned. The method of applying fluid applications of this kind, is to dip lint in them, and place it on the bleeding surface. Compression is generally adopted at the same time. That cold air has a styptic effect, we have the most unequivocal proofs. We frequently tie, on the surface of a wound, every artery that betrays a disposition to bleed, so long as the wound continues exposed to the air. We bring the opposite sides of the wound into contact, and put the patient to bed. Not an hour elapses before the renewal of hemorrhage compels us to remove the dressings. The wound is again exposed to the air, and again the bleeding ceases. I have repeatedly seen this happen in the scrotum, after the removal of the testis. The proper conduct in such cases is not to open the wound unnecessarily, but to apply cold wet linen to the part, and keep up a continual evaporation from its surface, by which means its temperature will be reduced, and the bleeding suppressed.

All styptics create great irritation in recent wounds, in which cases, therefore, scientific surgeons never have recourse to them. They are, however, judiciously used to suppress bleedings, from many diseased surfaces, where the vessels seem to have lost their natural disposition to contract.

---

* Clinique Chirurgicale, tom. ii. p. 304.

When an artery is partly cut through, it generally bleeds more profusely than when quite divided, because it can neither shrink under the surrounding substance, nor contract itself sufficiently to become impervious. Hence, when, in arteriotomy, the bleeding rom the temporal artery cannot be readily stopped by pressure, the surgeon sometimes suppresses the hemorrhage by cutting the vessel ompletely through.

Sympathetic inflammatory fever, attended with an increase in the velocity of the circulating blood, and an augmented action of the heart and arteries, is the consequence of all considerable wounds. Hence, during its predominence, the patient is particularly exposed to the danger of fresh hemorrhage.

If the vessels be small, and the patient plethoric, venesection is sometimes recommended, the loss of venous blood being less prejudicial to the constitution than that of arterial. The flow of blood into the wounded limb is to be decreased by placing the part (if possible) in an elevated posture; and cold applications or compression tried. If, however, the arteries should be above a certain size, and the hemorrhage still continue, they must be exposed, and tied.

Hemorrhages from external injuries seldom require internal means, which, if they were needed, possess but questionable virtue. However, keeping the patient in a cool situation, not covered with too many clothes, enjoining him to avoid all motion and exertions, and allowing him only a very low diet, are, undoubtedly, means well calculated to lessen the changes of hemorrhage.

[There are cases of hemorrhage when the surgeon must rely on internal treatment more than on local applications.—Instances of this kind are met with generally in feeble constitutions, and more frequently in females. The hemorrhage comes on at repeated intervals, and the patient becomes pale and exsanguinous, and his life seems in great jeopardy from the continued loss of blood.—These cases are troublesome, and are the source of much anxiety.

The cause of this kind of hemorrhage seems to be two fold. First, the blood is very thin and attenuated, and accordingly escapes more readily, and secondly, there is not power enough in the system to cause an effusion of fibrine, and thus close the mouths of the divided vessels.

This condition is readily known by the tumultuous action of the heart and the violent arterial pulsation pain in the head, &c.

The treatment indicated, is decidedly tonic and nutritive, so far as the general system is concerned, and locally, pressure and styptics are required.—Ed.]

TREATMENT OF WOUNDS.

EXTRACTION OF FOREIGN BODIES FROM WOUNDS.

This is the second indication, the stoppage of hemorrhage being considered as the first. The removal of all extraneous substances from a wound, is universally allowed to be an object of vast importance, because, if it be not fulfilled, the wound may be brought together as nicely, as accurately, and as skilfully as possible, and every thing look well at the beginning; yet, that desirable event, union by the first intention, will not follow, but, instead of it, a severe degree of pain, considerable swelling of the circumference of the injury, extensive redness, suppuration, large abscesses, and even the worst consequence, sloughing. All these aggravated effects frequently arise from the irritation of foreign bodies in wounds; and, as an incised wound can generally be examined at first, with the utmost facility, and properly cleaned, without putting the patient to much pain, the neglect on the part of the surgeon becomes the more blameable. In other deep, narrow or lacerated wounds, and in many gunshot injuries, it is often difficult at first to ascertain whether there are extraneous substances present, or not; or, when known to be there, their exact situation cannot always be determined; but, in open incised wounds, no such difficulty and obscurity prevail, and the surgeon who closes them, without having assured himself that they are perfectly free from all extraneous matter, betrays either supine negligence, or an utter ignorance of his professional duty. It is true, an incised wound, made with a clean sharp instrument, which has not broken, can have no foreign bodies in it; but very considerable and dangerous cuts are often produced by glass, china, &c., which break at the moment, and leave some of their fragments in the flesh. Sometimes, also, the weapon with which the wound is made is unclean; and sometimes, dirt, gravel, &c., get into the wound, in consequence of the patient falling upon the ground immediately he receives the injury. I shall merely repeat, that, as extraneous bodies create serious irritation in every kind of wound into which they happen to be introduced, the surgeon should always direct his attention to their removal as soon as the bleeding has been stopped.

Mr. Hunter believed that blood, retaining the living principle, and lying on the surface of a wound, was rather useful than otherwise, in promoting the reunion of the parts; and it was his particular opinion, that effused blood became hurtful to this process, only after being deprived of the living principle by long exposure, the effect of styptics, &c. Yet, this is a doctrine which is by no means sanctioned by the best modern surgeons, all of whom are perfectly convinced that leaving any blood upon the surface of a recent wound, when its opposite surfaces are to be brought together, is highly disadvantageous, retarding the cure, and rendering union by the first intention less certain. The presence of blood must, indeed, have the effect of producing a greater or lesser separation of the opposite surfaces, which strictly ought to touch one another. Neither has it the tendency to become organised, when left on the surface of a recent wound, which Mr. Hunter's doctrines would lead us to suppose. We do not find organisation follow coagulation of the blood, as it does the effusion of plastic lymph. At all events, this is not usually the case with blood effused on wounds, or into cavities; for blood, under certain conditions, may be organised after coagulation in its natural cavities.[*]

UNION BY THE FIRST INTENTION.

When the surgeon has stopped the bleeding, removed extraneous substances, and properly cleaned the wound, the next or third indication is to bring the opposite sides of the injury evenly together, and keep them quietly and steadily in its position, until they have united. Wounds may be healed by two processes[†], viz. by one, in which pus is produced, and granulations and new skin are formed; and by another, in which, if it perfectly succeed at every point, no suppuration whatsoever takes place. Surgeons have termed this way of healing wounds *union by the first intention, or adhesion*, and Mr. Hunter named the process by which it, together with many other analogous effects, is accomplished in the animal body, the *adhesive inflammation*. This last expression, I know, was disapproved of by the late Mr. John Bell, and is objected to by Dr. Macartney, who believes, that some wounds are promptly healed without any heat, redness, tumor, pain, or disturbed vascular action. (p. 50.) But, though these effects may occasionally be very slight, it appears to me, that even a cut finger cannot rightly be said to be perfectly free from one or more of them, short as their continuance may be rendered by the quickness with which the union is sometimes completed. It is not because the process is hindered by too high a degree of inflammation, that a low degree cannot accompany it, and even be an essential part of it.

---

[*] See Dr. G. Burrows on the Pathology of the Blood; in Med. Gaz. vol. xviii. The investigations of Andral, Carswell, and others, support the Hunterian doctrine of the possibility of effused coagulated blood becoming organised, forming adhesions, undergoing various morbid transformations, &c. Yet, that it has less tendency than coagulating lymph to become organised on the surface of a wound, and that its presence there is generally hurtful, are facts which no practical surgeons now entertain any doubt of.

[†] Dr. Macartney describes four, adding to such as are usually admitted, and here specified, two others; viz. 1. Immediate union, without the intervention of blood, or lymph. 2. Reorganisation, without any medium of lymph, or granulations, the cavity of the wound becoming obliterated by a natural process of growth, which he terms the modelling process, and consists, according to his observations, in the growth of the surfaces of the wound to the level of the skin, instead of the interval being filled up by any new-formed substance. Op. cit. p. 48—64, &c.

The great recommendations of union by the first intention, are celerity of cure; the hindrance of the pain which would arise from the exposure of raw surfaces; freedom from the inconveniences of suppuration; the prevention of the deformity which would result from a large regular cicatrix; and the greater permanency and soundness of the cure; as the part is covered by the old original skin, which is invariably stronger, and less disposed to ulceration, than what is new.

The strong tendency which divided parts of the animal body have to grow together, when kept a certain time in contact with each other, is an important fact, of which the moderns have taken much more advantage than the ancients. In the treatment of ordinary injuries, the latter seem to have availed themselves little, or not at all, of this readiness of raw living surfaces to grow together; and, as we may see by referring to Celsus, it was principally in making attempts to repair and improve the appearance of deformed and mutilated parts, that they applied their knowledge of the fact to practice. The moderns, however, (I speak more particularly of our countrymen,) have shown their high sense of the good purposes to which this tendency to adhesion in the animal body may be converted, by recommending and practising the immediate closure of every wound, for the keeping of which open there is not some very particular and specific reason. There are even circumstances on record, leaving no doubt of the fact, that it is not quite impossible for parts, entirely detached from the rest of the body, to become united again, if quickly replaced. One extraordinary case, generally quoted in confirmation of this statement, is that mentioned by Garengeot, where a soldier's nose was bit off, yet, on being immediately restored to its natural situation, it acquired there a permanent union.* Two other examples of the reunion of pieces of the nose, which were entirely cut off, are recorded by Fioraventi† and Blegny‡; and well authenticated cases of similar facts, in relation to other parts, may be found in different publications.§ The celebrated experiments of Duhamel and Mr. Hunter furnish, also, a mass of interesting evidence, completely displaying the possibility of reuniting some parts, which have been recently severed from the rest of the body. It was proved by Mr. Hunter, that the testicles of a cock, when introduced into the abdomen of a hen, contracted a vascular connection with the surface of the viscera, and lived; and that a sound tooth might be transplanted from its socket, and acquire an union in the alveolary process of another person. Lastly, he repeated Duhamel's experiment: he cut off the spurs of a young cock, and found that they might be made to unite to its comb, or that of another cock, and grow even to a larger size than natural, in such situations. The possibility of this species of union shows how strong the disposition of the surfaces of a fresh wound must be to grow together; particularly when it is reflected, that, in the foregoing instances, there can be, on one side, no assistance given to the union, as the separated part is hardly able to do more than preserve its own living principle, and (as Hunter expresses himself), accept of the union.*

---

* Traite des Operations, t. iii. p. 55.

† Secreti Medicinali, 12mo. Venet. 1561.

‡ Zodiacus Medico-Gallicus, Mars, 1680.

§ Bossu, in Journ. de Medecine, t. xxxiii.; Dr. W. Balfour's Obs. on adhesion, with two Cases demonstrative of the Powers of Nature to reunite parts which have been by Accident totally separated from the Animal System, 8vo. Edinb. 1814.

But, although this evidence is too strong to permit us to doubt the possibility of reuniting parts, which have been completely separated from the animal system, and in which the circulation of the blood has necessarily ceased for a time, it must not be dissembled, that attempts of this nature have generally failed. They are very successful, however, when the detached part still retains a partial and slight connection with the rest of the body, by means of only a few fibres, or a little bit of skin: a circumstance that makes a very material difference. As Dr. Thompson has said †, many cases are upon record, and many more have been observed, in which parts have been reunited which were completely detached, with the exception of a very small portion of cutis, a portion so small that it is not easy to conceive that any effectual circulation could be carried on through it; and he quotes from Arcæus an instance, in which the nose, and most of the upper jaw, were so extensively separated, as to hang down upon the chin, and yet were afterwards reunited. A remarkable example of the same kind was published by Larrey‡, one of whose assistants was actually about to cut through the connection which was left, when he was interrupted by the Baron, who happened to be on the spot. The instances in which the fingers, toes, nose, and ears have been entirely cut off, with the exception of a small bit of skin, and afterwards saved by adhesion, are so generally known, and frequently exemplified in practice, that it would be useless prolixity to dwell upon them.

The knowledge of the preceding facts cannot but prove useful in relation to surgery: it raises our confidence in the powers of nature, under circumstances in which we should otherwise entirely despair; and, with the precedents before us, we shall be induced to attempt the union of parts, and sometimes succeed, when the project would appear hopeless and absurd to any one uninformed of what has already happened in other similar cases.

---

* See Hunter on the Blood, &c. p. 208; and Duhamel, in Mem. de l'Acad. des Sciences, 1746.

† Lectures on Inflammation, p. 248.

‡ Mem. de Chir. Militaire, t. iv. p. 20. 8vo. Paris, 1817.

In promoting union by the first intention, surgery is merely to officiate as the handmaid of nature. There are only two indications: the first is, to bring the edges of the wound accurately together, and keep them so; the other is, to endeavor to keep off violent inflammation, by which the agglutination of the wound would certainly be prevented. The first object is accomplished by a proper position of the wounded part, and by the use of bandages, adhesive plaster, and sutures; the second is fulfilled by a strict observance of the antiphlogistic regimen, and particularly by avoiding every kind of motion and disturbance of the wound. The rest is the work of nature.

1. *Position of the part* is to be regulated on the principle of relaxing the wounded integuments and muscles. If the extensor muscles are injured, the joint which they move ought to be placed in an extended posture; if the flexor muscles are wounded, the limb is to be bent. When the integuments alone are cut, the same posture which relaxes the muscles, situated immediately beneath the wound, also serves, in general, to relax the skin. In transverse wounds of muscular fibres, it is astonishing what immense effect a proper posture has. This is never to be neglected, whatever may be the other means adopted.

2. *Bandages* may frequently contribute very essentially to keep the sides of the wounds duly in contact, as is strikingly illustrated in cases of harelip, where the opposite edges of the fissure may be brought forward so as to touch, and be maintained in this position by the simple use of compresses and a bandage. Such was the mode of treatment actually preferred by M. Louis; and, were it not for the greater convenience and certainty of the twisted suture, it is the plan to which surgeons would yet have recourse.

The common uniting bandage can only be applied to wounds which take a direction corresponding to the length of the body, or limbs, and which are situated where a bandage can be used with convenience and effect. It consists of a double-headed roller, with a slit between the two heads, large enough to allow one head of the roller to pass through it with facility. The proper dressings having been put on, the surgeon is to take one head of the roller in each hand, and apply the bandage first to that part of the limb which is opposite the wound. One head of the roller is then to be brought round, so as to bring the slit precisely over the breach of continuity. The other head is then to be brought round in the opposite direction, and passed through the fissure. The bandage is next to be drawn moderately tight, and, its two heads being carried round the limb again, the same artifice is to be repeated. A sufficient number of turns of the roller must be made to cover the whole length of the wound. When the wound is deep, small longitudinal compresses are sometimes put under the roller, at a little distance from the edge of the wound.

As the uniting bandage can only be made use of for longitudinal wounds, which never have a considerable tendency to gape, nothing can be more absurd than the application of it with immoderate tightness. By this cruel and injudicious practice many limbs and lives have been lost; for, if the bandage be very tight on its first application, what a dangerous constriction of the limb or part must follow, when the swelling, necessarily arising from the wound, has come on. It is thus that insufferable pain and gangrenous mischief have frequently been induced, when, if the part had been simply dressed, and left unconfined, every thing would have gone on most favorably. It is right to state, however, that modern surgeons are not partial to the uniting bandage, and I have no hesitation in saying, that it is a means which may be advantageously banished from practice. If it be true that it brings the sides of deep wounds together better than adhesive plaster alone, and that it acts without the irritation arising from the application of resinous substances to the skin, it still has many inconveniences: its total concealment of the wound, its lying in irregular folds, so as to create an uneven cicatrix, the difficulty of undoing it, and some other serious objections, might be mentioned. These reasons have rendered its employment much less frequent than in former times, and, I may say, that its use in this country is now superseded by the preference universally and justly given, either to a common roller, or an eighteen-tailed bandage.

3. *Adhesive plaster* is generally applied in strips, between every two of which an interspace is recommended to be left, for the purpose of allowing the discharge to escape, in the event of any part of the wound not healing in the ready manner which is desirable. Therefore, to bring the edges of the wound effectually together, and, at the same time, to leave a little room for the exit of the discharge, are the leading objects to which we ought to attend in using adhesive plaster. Hence, when the strips are broad, it is not unfrequent to cut out an oval piece of each strip just where it crosses the wound. When the plaster is about to be applied to parts where hair grows they should first be shaved; and, if wet, they should be made dry.

Adhesive plaster is of great use, even in many wounds in which it is impossible to bring their sides completely into contact; for, by bringing and retaining them nearer together than they would otherwise be, the strips lessen the size of the wound, and ultimately, when the gradual elongation of the old skin begins to take place, they succeed in bringing the separated parts perfectly together.

A pledget of simple cerate is often applied over the plasters: it is frequently preferrable to dry lint, which sticks to them and the ligatures, and is more troublesome to remove. Instead of common adhesive plaster, Mr. Liston uses a solution of isinglass in brandy, smeared upon oil silk or riband, as an excellent and less irritating means of keeping the sides of wounds together. The application is sometimes not removed till the wound is cured; a plan which, when it can be followed, certainly saves the patient from all the pain usually experienced at every removal of the dressings.

4. *Sutures.* Of the numerous sutures used by the old surgeons, only two are now ever employed in this country, viz. the *interrupted* and the *twisted*. The latter will be spoken of in the observations upon harelip. The *interrupted suture* is applied as follows:—When the bleeding has been suppressed, and all extraneous substances have been removed, the surgeon is to place the limb in such a posture as shall enable him to bring the lips of the wound easily into contact. The needle armed with a ligature, and having a curvature that forms the segment of a circle, is then to be introduced into the right lip of the wound, at a small distance from its edge, and is to be directed across the wound, so as to come through the left lip from within outward. It is now to be cut off, and the ligature tied in a bow. These sutures should always be at least an inch from each other. At the same time, strips of adhesive plaster, and a bandage for the support of the part, are usually employed.

In the present schools of surgery, the use of sutures is less recommended than in former days. By the combined operation of position, adhesive plaster, and a bandage, the generality of wounds are capable of being united as expeditiously and well as they could be were sutures employed. In the treatment of harelip, wounds of the face, large wounds penetrating the abdomen, wounds after castration, and operations for hernia, we must, however, admit their utility. In wounds of the lips, the incessant and unavoidable motion of the parts, and in those of the abdomen, the distention arising from the viscera, and the danger of their being protruded, are reasons which, in these particular instances, may account for the advantages of sutures. But, in general, the promotion of union by the first intention cannot be set forth as a valid argument in favor of the practice. Inflammation, above a very moderate pitch, always destroys every prospect of this nature, and occasions the secretion of pus, instead of the exudation of coagulating lymph. Sutures have fallen into disrepute, principally because they tend to increase inflammation. The new wounds which they make, their irritation as extraneous bodies, the forcible manner in which they drag the living parts together, and their incapacity, in general, to accomplish any useful purpose, which position, adhesive plaster, and bandages cannot effect, are strong motives for reprobating their common application.

Extensive erysipelatous redness, uncommon pain, and severe nervous symptoms, will often be found to originate from the irritation of sutures. I believe, that they are still too much resorted to by the mechanical class of surgeons.

[The suture, especially the interrupted, is not as objectionable, as many writers would lead us to suppose. There are two varieties of suture, the tight, and the loose. The former strangulates all the parts it encloses, and consequently, produces much irritation and ulceration, and often prevents the attainment of the object for which it is employed. The latter, the loose suture, does not strangulate, but simply approximates the lips of the part, and often remains in the edges of the wound until they are firmly united, and until it is cut out by the surgeon.

By having a proper regard to the manner of application of the suture, very great advantage will be realized from its employment. In staphyloraphia, for instance, we should cautiously avoid the use of the tight suture, and it has been recommended by some surgeons, that after the threads are introduced, we wait for an hour or two before we tie them; because, if tied immediately, the parts included may swell, and this cause strangulation, and, thereby, defeat the success of the operation.

If, on the contrary, we have occasion for the use of the suture in wounds of the intestines, we should always prefer the tight; in order that the knot may pass into the bowel by ulceration, as it will do, and in that way escape from the body.—Ed.]

Such are the principal means for keeping the opposite surfaces of wounds in contact, until union has taken place. The first plasters and dressings should continue on the part at least three or four days, unless any disagreeable symptoms, as excessive pain, hemorrhage, &c. indicate the contrary. The cause of the severity of the pain should always be duly considered, and, if possible, removed: sometimes it is owing to the sutures; sometimes to the immoderate tightness of the roller; and, occasionally, to extraneous substances yet lodged in the wound.

When too much inflammation is apprehended, the bandage should never be tight, and wetting it with cold water may be of use. Perfect quietude, and an antiphlogistic regimen, should be observed. The old plan of covering the dressings with thick woollen rollers, caps, and large masses of tow, is entirely rejected in this metropolis, as being inconsistent with those principles which are recognised by every scientific surgeon as best calculated to avert and lessen inflammation.

When the first dressings are removed, the surgeon often finds union by the first intention accomplished only at certain points of the injury; and the connexion even there still requiring further support. On the application of the second dressings, however, it is generally unnecessary to put on as many strips of adhesive plaster as were at first employed, and their number may be gradually lessened at each future dressing. The sutures, if there are any, should also be now withdrawn, as they can do no further good, and their continuance may excite irritation, and do harm. Throughout the rest of the treatment, also, the dressings should be light, simple, and unirritating.

I shall conclude this part of the subject with a few useful rules in the dressing and examination of wounds.

The first is, never to give the patient more pain from our modes of procedure, or methods of dressing, than is absolutely necessary for his present good or future security. For instance, we ought never to probe a wound, where probing can be of no use; and we should be contented to remain ignorant of things, the knowledge of which would only gratify an idle curiosity.

The second is, that any requisite examination of a wound should be made as soon after the accident as possible; for, at this period, inflammation and swelling not having had time to come on, the patient suffers much less pain from the introduction of the probe, or finger, into the wound, and the surgeon more easily gains information which he is in search of, than in later stage.

Another good rule is to let all the fresh dressings be perfectly ready before the old ones are removed. A sponge and warm water, adhesive plaster, lint, ointments, lotions, nitrate of silver, bandadges, &c. should all be at hand, and not left to be looked for at the very moment when they are wanted.

As in many instances the removal of the dressings, and the applications of others, take up a considerable time, we ought carefully to reflect what position would be most easy to the patient, and, at the same time, most convenient to the surgeon.

When the bandage, adhesive plaster, and other dressings have become hard and dry, and glued together, and to the surrounding skin, by blood, or other discharge from the wound, the surgeon should soften and loosen the applications by wetting them a sufficient length of time with warm water, which is to be pressed out of a sponge upon them, a basin being held below the part for the reception of the water as it falls off the dressings. This duty is of much importance in saving the patient from a great deal of agony, which the abrupt removal of the adherent dressings would produce.

In removing the dressings which are under the bandage, we should be careful that the ligatures are not entangled, and forcibly pulled away, so as to give severe pain, and create a risk of hemorrhage.

The strips of adhesive plaster should be removed by taking hold of their ends, each of which is to be drawn towards the wound. Were the plasters pulled off in the contrary direction, the edges of the wound would be liable to be torn asunder again, and the process of reunion, at all events, disturbed; neither should the plasters be pulled up, as by this proceeding the edges of the wound would be torn from the subjacent parts.

In large wounds, only a single strip, or at most two, should be off at a time, and the part from which the plaster has been removed, having been carefully wiped with a sponge, and dried, is then to be supported with a fresh strip, before any more strips are taken off. As Dr. Thompson well observes, it is from inattention to this rule, that wounds are daily torn open again at each dressing, merely by the weight of the parts.

The sides of the wound, particularly if it be large and deep, should always be supported by an assistant at the time of changing the dressings.

When there are several wounds, only one is to be opened and dressed at a time, so that all unnecessary exposure of the parts may be avoided.

At each dressing, care must be taken to prevent lodgments of matter, by placing the compresses and strips of plaster in the manner best calculated to press upon and obliterate any cavity in which he pus has a tendency to accumulate.

The utmost attention should be paid to cleanliness, every thing filthy and offensive being removed from the ward as quickly as possible. Above all things, care must be taken not to let the matter touch the bedclothes. The custom of laying a piece of oilskin under suppurating wounded parts, in order to keep the bed clean, is highly praiseworthy; for cleanliness is essential to the general health of the patients, and the favorable progress of all the wounds.

The frequency of dressing must be regulated by the quantity and quality of the discharge; by the situation of the injury; by the climate and season of the year; by the effect which the renewal of the dressing seems to produce; and by the feelings, and sometimes the wishes, of the patient.*

PROCESS BY WHICH THE WOUND IS UNITED.

When the opposite sides of an incised wound are maintained in contact, they soon become permanently connected together. The vessels of the wounded surface cease bleeding, and their extremities become impervious to the blood itself, but not to the coagulating lymph, or fibrine, which forms the general bond of union between living parts. This uniting medium is the primitive and most simple connection that takes place between the two sides of a wound. In many cases, where the wound is closed before the hemorrhage has had time to cease, no doubt a quantity of blood must be interp osed between the opposite surfaces of the injury; but such blood is now suspected, by many good pathologists, not to become itself the first bond of union; but, on coagulating lymph being effused, to be generally absorbed, as answering not only on useful purpose in the healing process, but if too abundant, proving an impediment to the cure without suppuration. Hence, the best practical surgeons always make the surface of the wound as free from blood as possible, before its opposite sides are brought together. I am quite sure, that union by the first intention more certainly follows this mode of proceeding. Yet we are not to defer bringing the sides of a wound together, until every little oozing of blood is at an end; for the long exposure of the wounded surface would be hurtful, and tend to defeat the grand object in view, direct adhesion, without suppuration. The doctrine of the occasional extension of vessels into a clot of blood is considered, however, by Professor Carswell, Macartney, and others, to admit sometimes of demonstration. Dr. Macartney states, that he has seen vessels passing for a short way into a clot of blood, covering the surface of an ulcer, &c. He also succeeded in making injection pass into the coagula, formed in the cavities of the heart after death, which injection presented the appearance of red elongated lines. (P. 54.) Clots of blood are often enveloped in fibrine, a substance into which vessels are prone to extend themselves from those of the nearest texture; and this has sometimes been suspected to be the case in certain preparations put up by John Hunter himself, to demonstrate the vascularity of clots of blood, and preserved in the museum of the Royal College of Surgeons, in London.

---

* See Thompson on Inflammation, p. 294, &c.

We have examples of the union of textures without suppuration, and, in this respect, by a process similar to union by the first intention, in bones which have been fractured; in tendons which have been ruptured; and even sometimes in muscles, which have been wholly or partially torn asunder, without any division having been produced in the skin which covers such parts. In the sudden and violent division of these textures, blood is always effused between the divided parts, and into the surrounding cellular tissue. When this extravasated blood is not very considerable in quantity, and when the parts from which it has been effused are not too severely injured, it is observed to be gradually absorbed, in proportion as the process of union advances. If the divided surfaces be examined a few hours after the accident, they will be found to be covered with coagulating lymph. This substanc, indeed, appears to be effused very quickly after the injury. Professor Thomson found, that, in animals, a distinct layer of it was effused over their wounds in less than four hours.* But, says he, whatever may be the period at which it is first formed, it is now well ascertained, that, in healthy subjects, when fractured, torn, or ruptured surfaces, to which the external air has not been admitted, are properly covered with this layer of coagulating lymph, and kept in contact, they speedily coalesce, and that, by this fibrine becoming a living intermedium, the continuity of the divided part is at length restored. Appearances, precisely similar to such as happen in divisions without communication with the external air, take place in simple, incised wounds, the edges of which have been brought together before, or soon after, the bleeding has ceased. If a wound of this kind be torn open soon after its reunion, the surfaces, which had been united, are seen covered with a substance resembling jelly, which is the coagulating lymph, or fibrine of the blood. By some it is supposed, as I have said, that this lymph is poured out from the smaller vessels which have been cut; but Professor Thomson inclines to the opinion, that it is chiefly, if not wholly, formed by the secreting action of the capillary vessels of the divided surfaces.*

---

* On Inflammation, p. 209.

The simple agglutination of the sides of a wound together, is what may be considered as taking place very shortly after they have been brought into contact with one another. The next step, in the process of union by the first intention, is the extension of vessels into the coagulating lymph, and this is soon followed by an intercourse between the vessels of the two sides of the wound. The manner in which the new vessels arise in the uniting medium, as well as the way in which the inosculation of the divided vessels happens, are at present only matters of conjecture. Mr. Hunter once conceived that blood and coagulating lymph, so long as they retained the living principle, possessed the faculty of generating vessels within themselves, quite independently of any adjoining surfaces; and, in the growth of the chick, there are unquestionably some appearances in favor of this opinion. This doctrine, however, he renounced previously to his death, and adopted the belief, which is now daily gaining ground, that the new vessels are extensions from the old ones. Professor Thomson delivers the following statement: the coagulating lymph, or fibrine, soon after its exudation, becomes penetrated with bloodvessels, *which proceed from the divided surfaces*, appear to join in the process of reunion by open extremities, or, in other words, to inosculate with one another. The blood now circulates freely through the new-formed channels of communication established between the vessels, which penetrate the lymph effused upon the surfaces formerly divided; and the vessels which shoot into the lymph often acquire, in the course of a few hours, a size, which renders them capable of being injected. The precise manner, in which the vessels are extended into the coagulating lymph is still unknown. It has not been positively settled, whether it is the divided vessels which penetrate the lymph. The extremities of the larger branches are closed with the effused lymph, and removed by means of it and their natural elasticity to a distance from each other. Dr. Thomson regards the circumstances as insurmountable bars to their immediate inosculation; and he remarks, that, if it be the closed vessels which are prolonged into the lymph, each small artery must obviously have its corresponding vein. But, says he, the inosculation, or direct union of the small bloodvessels from the opposite surfaces of the wound, however difficult to conceive or explain, is a truth undeniably established.* He then adverts to Duhamel's experiment, which fully proves, that, in the reunion of parts which have been divided, the bloodvessels from the opposite surfaces inosculate directly, and do not merely pass one another. Duhamel broke the legs of six chickens, and, after the bones had reunited, he cut through about one third of the soft parts, covering the callus, or new bone. When the wound had healed up, he divided another third part, and in the same manner the remaining third part, sparing neither bloodvessel, tendon, nor nerve. Only one of the six chickens survived these cruel operations; but, upon injecting the artery at the upper part of the thigh, the injection penetrated to the lowest part of the leg. "I cannot say (Duhamel remarks) whether the large vessels, filled by the injection, were dilated capillary vessels, or the large vessels of the leg, which had been reunited; but the experiment proves irrefragably the inosculation of the bloodvessels." Later observations than those of Duhamel (says Professor Thomson) have shown, that it is by the small vessels, and not by the larger trunks, that the inosculations are formed, by which the divided parts of a limb are supplied with blood; nor does he accede upon this point to the sentiment of Hunter, who conceived that he had certainly succeeded in observing inosculation on the tunica conjunctiva of the eye, the vessels of which are frequently divided by surgeons in cases of ophthalmy. He states, that the two ends of the cut vessels are seen to shrink; but, after a while, they are perceived to unite, and the circulation is carried on again.†

---

* Op. Cit. p. 210.

The celerity, with which the process of union by the first intention is completed, is a circumstance that must excite the admiration of the philosophical surgeon. In the short space of seventy-two hours, the wound, produced by amputation of the thigh, is often securely united through its whole extent, without any suppuration, except just where the ligatures are situated. Incised wounds of a moderate size may, in general, be completely healed by this method in forty-eight hours. How different, then, is the surgery of the present day, to that of half a century ago, when the bigoted prejudices of our ancestors deterred them from doing, not only what was most salutary, but most simple! The complicated business of accomplishing digestion, incarnation, and cicatrisation, is now reduced to the easy duty of bringing the sides of a clean cut wound together, and maintaining them so until they have grown together.

---

* P. 212.

† On the Blood, p. 198.

As John Bell has observed, "there is no wound in which we may not try with perfect safety to procure this adhesion; for nothing surely can be more kindly, when applied to a wounded surface, than the opposite surface of the same wound: it has been but just separated from the opposite surface: it may immediately adhere to it: though it do not adhere, no harm is done; still the wound will suppurate as kindly, as freely, as if had been dressed with dry lint, or some vulnerary balsam, or acid ointment. If only a part suppurate, while one half, perhaps, adheres, then half our business is done: and, in short, this simple way of immediately closing a wound is both natural and safe."[*] If I were to instance any one circumstance, in which I think the excellence of English surgery strikingly displayed, I should be inclined to cite our partiality to the mode of curing wounds by the first intention. M. Roux[†], in his criticisms upon this part of our practice, may convince his readers how sincerely he believes what he says; for he actually fancies, that we have been, as it were, forced into the custom of healing up wounds as quickly as we can, because, unfortunately, in this country, we have not, as he conceives, a sufficiency of the requisite materials for dressing wounds, which are to heal by suppuration! But I doubt whether he will be joined by any surgeons on this side of the Channel in the belief, that it would be better to abandon the practice of adhesion altogether, than make it an exclusive method of treatment. He particularly mentions the wound after castration as unfit for this plan, because the edges cannot be easily put into a state of coaptation, unless a considerable piece of the scrotum be cut away, and sutures be used; and also because the closure of the wound is attended with the risk of a collection of blood taking place in its cavity, and nature is nearly as long in effecting a cure, when the sides of the wound have been brought together, as when they not. But, if the principle were to be admitted, that the possibility of bleeding within a wound is an adequate reason for filling it with charpie, and not attempting to heal it by the first intention, we ought to renounce this last beneficial practice in every instance, where the surface of the wound is extensive, and its cavity large, as after amputation, the removal of a breast, the extirpation of tumors, &c. But, even supposing the scrotum should sometimes become filled with coagulated blood, of which M. Roux is so much afraid, it may then be inquired, which of two patients would be the best circumstanced, one with the scrotum crammed with charpie, or another with the same part distended with coagulated blood? Which would suffer least pain, have the most moderate suppuration, and get well in the shortest time? If the answer to these problems be so doubtful, as not to admit of being readily delivered, surely we may be allowed to argue thus: that if, when the evil complained of by M. Roux does really occur, the patient is not decidedly worse off than when such disaster does not happen, but the particular treatment recommended by that gentleman is followed, how much better it must be to let the patient, at all events, have the chance of a considerable portion of the wound uniting; for when this is accomplished (to use Mr. John Bell's phrase) half our business is done.

---

[*] Discourses on the Nature and Cure of Wounds, by John Bell, p. 14. edit. 3.

[†] Parallèle de la Chirurgie Angloise avec la Chirurgie Françoise, p 117. et suiv. 8vo. Paris, 1815.

But if any wound require more strongly than others the approximation of its edges, and to be healed, if possible, by adhesion, it seems to me, that it is the incision made in the Hunterian operation for aneurism. Here the wound should be closed to let the artery lie quietly amongst its natural connexions, undisturbed by the contact of any dressings, or other extraneous substances, by which the adhesion of its sides might be prevented, its ulceration induced, and secondary hemorrhage occasioned. But, extraordinary as it may appear, this is another example of our practice, selected by M. Roux to illustrate our blind predilection for healing wounds by the first intention. The wonder ceases, however, when we find that he considers ligatures of reserve (ligatures d'attente) advisable means in operations for aneurism; for they are undoubtedly awkward things in a wound which ought to be healed as quickly as possible, and they put union by the first intention out of the question. But, in London, where the inutility and dangers of these ligatures of reserve are well understood, a practice, which tends to abolish their use, will be welcomed as bringing with it another high recommendation.

PUNCTURED WOUNDS

Are not only dangerous on account of their frequently extending to a considerable depth, and injuring large bloodvessels, nerves, viscera of importance, and a great variety of textures, they are also dangerous, inasmuch as they frequently give rise to violent and extensive degrees of inflammation. It is not uncommon to see them followed by formidable collections of matter, especially when the instrument with which they have been made, has penetrated deeply through an aponeurosis or fascia. The extension of inflammation along the continuous textures from the original seat of the puncture, and the formation of matter under the fasciæ, are two of the most remarkable local phenomena, which are particularly liable to arise from punctured wounds.* Stabs, and all other punctures, are not simple divisions of the fibres of the body: they are attended with more or less contusion and laceration. Hence, there is not the same readiness to unite, which we observe in wounds made with sharp cutting instruments; and, when the weapon has entered deeply through tendinous expansions, the inflammation excited often spreads very extensively, attended with most severe pain, in the parts affected, great tension, swelling, and abscesses running under the fasciæ to an alarming extent. Violent symptomatic fever, and great agitation of the nervous system, likewise often follow punctured wounds; effects which used to be erroneously attributed to the injury of tendons or nerves. This doctrine, however, is now nearly exploded. Surgeons frequently see nerves of considerable size and large tendons wounded, without the occurrence of great constitutional disorder; therefore, it cannot be the mere injury of these parts which is the occasion of all the general indisposition.

---

* Thomson's Obs. made in the Military Hospitals in Belgium, p. 29. 8vo. Edinb. 1816.

More is to be feared, I think, from the frequent depth of a stab or puncture, the roughness and violence with which the injury has been done, and the many different textures pierced, than from the circumstance of tendons or nerves happening to be wounded. Amongst the worst kinds of general indisposition, more frequently following punctured, than other descriptions of wounds, is tetanus; a complication still oftener seen in warm climates than in our own.

Punctured wounds are generally more dangerous and difficult to cure than cuts and sabre-wounds, though much depends upon the nature of the parts injured. When great degrees of swelling and inflammation follow, when considerable abscesses form, when phlegmonous erysipelas arises, or when a large artery or important viscus is wounded, and blood or other fluid is extravasated, the case is undoubtedly of a serious and dangerous nature. The same remark may be made when tetanus, or violent symptomatic fever, and great agitation of the nervous system, complicate the injury.

In the treatment of punctured wounds, mistaken doctrines were formerly the source of many serious abuses in practice. The unlimited idea, that the severe consequences of most punctured wounds were in a great measure owing to the narrowness of their orifices, induced numerous surgeons to practise, indiscriminately, deep and extensive incisions, for the purpose of rendering their external communication considerably wider. To have in view the conversion of such injuries into simple incised wounds, was always a maxim strongly insisted upon, and urged as the reason for such treatment.

Certainly, if the notion were true, that an important punctured wound such as the stab of a bayonet, could be actually changed into a wound partaking of the milder nature of an incision, by the mere enlargement of its orifice, the corresponding practice would be highly commendable, however painful. But the fact is otherwise: the rough violence, done to the fibres of the body by the generality of stabs, is little likely to be suddenly removed by an enlargement of the wound. Nor can the distance, to which a punctured wound frequently penetrates, and the number and nature of the parts injured by it, be at all altered by such a proceeding. These, which are the grand causes of the collections of matter, which often take place in the cases under consideration, must exist, whether the orifice and track of the wound be enlarged or not. The time when incisions are proper is when there are arteries to be secured, foreign bodies to be removed, abscesses to be opened, or sinuses to be divided; and to make painful incisions sooner than they can answer any end is both injudicious and hurtful. They are sometimes rendered quite unnecessary by the union of the wound throughout its whole extent, without the least suppuration.

It is true, that making a free incision, in the early stage of these cases, seems a reasonable method of preventing the formation of sinuses, by preventing the confinement of matter, and, were sinuses an inevitable consequence of all punctured wounds, for which no incisions had been practised at the moment of their occurrence, it would undoubtedly be unpardonable to omit them. To many this may seem a fair reason for enlarging the mouth of a punctured wound. Fair, however, as it may appear, it is only superficially plausible, and a small degree of reflection soon discovers its want of real solidity. Under what circumstances do sinuses form? Do they not form only where there is some cause existing to prevent the healing of an abscess? This cause may either be the indirect way, in which the abscess communicates externally, so that the pus does not readily escape; or it may be the presence of some foreign body, or dead portion of bone; or, lastly, it may be an indisposition of the inner surface of the abscess to form granulations, arising from its long duration, but removable by laying the cyst completely open.

Thus it becomes manifest, that the occurrence of suppuration in punctured wounds is only followed by sinuses when the surgeon neglects to procure a free issue for the matter after its accumulation, or when he neglects to remove any extraneous bodies. But, as dilating the wound at first, will only tend to augment the inflammation, and render the suppuration more extensive, it ought never to be practised in these cases, except for the direct objects of giving free exit to matter already collected, of tying a wounded artery, or of being able to remove extraneous bodies palpably lodged. I shall once more repeat, that it is erroneous to suppose the narrowness of punctured wounds so principal a cause of the bad symptoms, with which they are often attended, that the treatment ought invariably to aim at its removal.

Recent punctured wounds have absurdly had the same plan of treatment applied to them as old and callous fistulæ. Setons and stimulating injections, which in the latter cases sometimes act beneficially by exciting an inflammation, that is productive of the effusion of coagulating lymph, and of the granulating process, can never prove serviceable when the indication is to moderate an inflammation, disposed to rise too high. The counter-opening, which must be formed, in adopting the use of a seton, is also an objection; and though French authors have given us accounts of their having drawn setons across patients' chests, in cases of stabs, they would find some difficulty in making the practice seem unattended with harm, much less productive of good. The candid and judicious surgical reader should not always think a plan of treatment right, because the patient gets well; for, there is an essential difference between a cure, promoted by really useful means, and an escape, notwithstanding the employment of hurtful ones.

Why, however, should we mention the use of a seton? What good can possibly arise from it? Will it promote the discharge of foreign bodies, if any are present? By occupying the external openings of the wound, will it not be more likely to prevent it? In fact, will it not itself act with all the inconveniences, and irritation, of an extraneous substance in the wound? Is it a likely means of diminishing the immoderate pain, swelling, and extensive suppuration, so often attending punctured wounds? It will undoubtedly prevent the external openings from healing too soon; but cannot this object be effected in a better way? If the surgeon observe to insinuate a piece of lint into the sinus, and pass a probe through its track once a day, the danger of its closing too soon will be removed.

The practice of enlarging punctured wounds by incisions, and of introducing setons, is often forbidden by the particular situation of these injuries.

I do not follow many surgical writers in recommending the indiscriminate dilatation of the orifices of punctured wounds; nor the use of the knife, for the purpose of preventing mischief only expected and apprehended but not certain of taking place. Whenever I have attended bayonet or other punctured wounds, unattended with any particular complication, I have always observed nearly the same principles as are now so generally approved of in gunshot wounds. I have abstained from dilating the orifice of the injury, except when it was necessary, either to get at a bleeding artery in the first instance, or to relieve constriction of the parts, or to procure a freer outlet for the discharge in a later stage of the case. I have given the preference to mild, simple, unirritating, and superficial dressings. I have not placed any faith in the utility of enveloping the parts in a tight bandage; but, after applying the first superficial dressings, have usually covered the limb or part with linen wet with the lotio plumbi acetatis, or cold water. Whenever a roller was used in the beginning of a case, it was not with the view of making pressure, but of retaining the dressings. The wound having been dressed, I then put in practice all such means as are generally deemed most efficient in preventing and diminishing inflammation; such as venesection, the exhibition of aperient saline medicines, low diet, &c. When the pain was severe, opiates were prescribed, and on the access of much inflammation and swelling it was an invariable rule with me to be sure that the bandage was slack. On the whole, I believe, that the application of superficial dressings and cold washes is the best practice for the first twenty-four hours after the receipt of a punctured wound. But if, after this period, the pain should increase, and the swelling and tension become more and more considerable the surgeon may then remove the linen and bandages, and apply leeches freely and repeatedly to the neighborhood of the wound. He may also substitute for the cold lotions fomentations, and emollient poultices, under which is to be laid, over the orifice of the wound, a small pledget of spermaceti cerate, or the tepid water dressing may be employed. The poultices and fomentations are to be renewed twice a day, and the leeches and venesection, if necessary, repeated.

Sometimes, under this treatment, the surgeon is agreeably surprised to find the consequent inflammation mild, and the wound united by the first intention. More frequently, however, in cases of deep stabs, the pain is intolerable; the fever and disturbance of the nervous system severe; and the inflammatory symptoms run so high, as to leave no hope of avoiding suppuration. In this condition, emollient poultices and fomentations are the best applications; and, when the matter is formed, its speedy and effectual discharge is to be procured, either by dilating the original wound, or by making one or more incisions in other places, as may seem most advantageous. In short, the treatment must then conform to the principles, already noticed in the remarks on suppuration and abscesses.

On the accession of the symptoms here adverted to, Professor Gibson joins those practitioners who resort to dilatation of the wound, and making a transverse division of the fascia, by which means, he states that the urgent symptoms will cease almost immediately.*

CONTUSED AND LACERATED WOUNDS.

The instruments, which have the effect of producing what is termed a *contused wound*, are either of an ordinary description, such as a cudgel, stone, &c.; or they consist of balls, bullets, and other metalic bodies, which are driven into the living textures with immense velocity by the explosion of gunpowder. Indeed, a forcible collision of any blunt, obtuse, hard body against parts of the living body must contuse, and often at the same time wound them.

---

* Institutes, vol. i. p. 63. ed. 5.

Gunshot wounds, strictly speaking, are only examples of severe contused wounds, though surgeons find it expedient generally to treat of them as distinct and peculiar cases; and when it is recollected how many difficult, intricate, and momentous questions the subject embraces, the necessity of considering it by itself must be generally acknowledged.

The blunt weapons, or obtuse hard substances, which, being applied with violence to any part of the living body, bruise, rupture, and otherwise hurt the fibres and vessels, may produce two different species of injury. First, they may more or less forcibly compress and crush the parts upon which they act, so as to disorder the texture of those organs which are situated under the integuments, without causing, however, any breach of continuity in the skin itself. This is the case, which is familiarly called a *bruise* or *contusion*, of which one of the worst examples is seen in the effects of cannon-balls, which graze the surface of the body, and crush the muscles and other deep-seated parts, while the skin itself remains unbroken. Secondly, a hard blunt body, violently striking against parts, may produce at once a solution of continuity, extending through the skin, and sometimes also through other textures: this kind of accident is what surgeons name a *contused wound*. The latter injury more commonly follows, when the surface of the contusing weapon is not very broad. The cases, which rank as simple contusions, I shall consider hereafter.

The majority of wounds are attended with some degree of contusion. Those which are inflicted with the blunt edge of a sabre, or the obtuse point and wedge-like end of a bayonet, are as much contused as punctured; and hence, like other contused wounds, they do not often admit of being united by the first intention. It must be confessed, indeed, that all our endeavors to reunite the sides of a contused wound, however skilfully directed, most frequently fail. An agglutination of the parts at most only takes place at the bottom of the wound, in which situation the flesh has suffered less contusion, the violence having spent itself, as it were, upon those parts upon which it first operated. Hence, suppuration of the external portion of the wound is mostly unavoidable. Still, the attempt at reunion ought to be made; for, if only the bottom of the wound heal by the first intention, it is a great advantage gained, more especially, when the surface of a bone has been exposed, and uncovered by the injury. In bringing the sides of contused wounds nearer together, however, the surgeon is not to attempt to do it with the same closeness and accuracy, as in the instance of an incised wound. The injured parts would not bear the pressure, nor other means requisite for this purpose; and it may be laid down as an established rule, that nothing is more hurtful to contused wounds than much pressure, either from strips of adhesive plaster, or from rollers. In few of these cases, also, are sutures admissible; and I think that examples have fallen under my notice, where the rash determination of the surgeon to close large contused wounds with stitches, tight strips of plaster, and bandages, had no inconsiderable share in bringing on the rapid and fatal gangrene which carried off the patients. When I say, therefore, that a contused wound ought to be closed, and that its opposite surfaces should be brought nearer together, in order that the chance of some part of the injury uniting by the first intention may be taken, I do not mean to recommend dragging the parts together by main force, or placing them in a state of constriction. On the contrary, I think that they ought to be left quite unconfined, the adhesive plaster being used very sparingly, and so put on as rather to hold the loose parts nearer to one another, than to press and draw them into contact. Nor should the wound be covered with much plaster, as one or two strips will suffice for the object in view, and a greater number would create irritation, besides hindering other better dressings from touching the raw surfaces. Merely a strip or two are to be applied to such points as seem most advantageous in lessening the exposed surfaces, and all constriction should be most carefully avoided. That the practice here advised may be followed by a beneficial result is proved by daily experience; and theory would lead us to expect such good, when we remember, that, by preventing the wound from gaping in the manner it would otherwise do, we not only afford an opportunity for parts of it to reunite, but at once diminish an inevitable cause of inflammation and suppuration, viz. the continued exposure of a raw surface.

Contused and lacerated wounds not only differ from incised wounds in the circumstance of being more disposed to suppurate and slough, and more difficult to heal by the first intention, they differ also in the particularity of not usually bleeding much: sometimes, not even when the largest arteries are lacerated, as must be the case when whole limbs are torn away, in consequence of becoming entangled in different kinds of machinery. The circumstance, which hinders the bleeding from being considerable in such cases was first correctly pointed out by professor Turner*; namely, the middle and inner coats of the vessel are lacerated, separated from the more elastic external coat, and thrown into irregular folds within it, so as to constitute a barrier against the escape of the blood.† Here the very same change takes place as occurs when torsion of arteries is practised. This indisposition to hemorrhage is not altogether a favorable omen, because, though the patient runs less chance of bleeding to death in these cases than in cut wounds, yet the very circumstance of the large vessels not pouring out blood evinces, that the violence, contusion, stretching, and other injury done to the parts, in addition to the mere division of them, must have been excessively severe, and that the danger of the subsequent inflammation, suppuration, and sloughing of the parts, is more than a counterbalance to any advantages proceeding from the absence of hemorrhage.

---

* See Edinb. Med. Chir. Trans.

† Speaking of the bleeding being sometimes profuse, directly after the receipt of a gunshot wound, M. Larrey, jun. observes, "L'hémorrhagie est plus fort si une artère est divisée partiellement, que si elle a été tout-à-fait rompue, parceque, dans ce dernier cas, le vaisseau éprouve une sorte de torsion et de refoulement par la force contondante ou l'attrition ; sa tunique interne se déchire et se tortille en tire-bouchon, de manière à oblitérer lorifice de l'orifice de Partère."—Hist. Chir. du Siége de la Citadelle d'Anvers, p. 60. 8vo. Paris, 1833.

In the records of surgery, no facts are more extraordinary than those which have been published, at different periods, on the subject of whole limbs being torn away, not only without hemorrhage, but without any fatal effects. The examples of this, related by Cheselden, La Motte, Carmichael, Morand, and Gibson,* are some of the most remarkable.

All lacerated and contused wounds should be treated according to common antiphlogistic principles. When the injury is extensive, and attended with a great deal of contusion, venesection is to be practised, and any moderate oozing of blood from the surface of the wound promoted by the use of fomentations. With respect to dressings, they should always be of a mild unirritating quality. After lessening by means of a strip or two of adhesive plaster the exposed cavity of the wound, if this be large, and the surrounding skin loose, or detached from the subjacent parts, the wound may be covered either with lint dipped in tepid water, over which is put a piece of oiled silk, or with a pledget of unguentum cetacei, over which should be laid an emollient poultice. The first dressings should not be removed for at least two or three days. Afterwards, however, the dressings may be changed once or even twice in a day; for as soon as the sloughs begin to separate, and suppuration commences, the necessity of renewing the dressings and poultices more frequently is evident. In severe cases, fomentations may be used at the periods of dressing, as nothing will be found more effectual for the relief of the pain. The employment of leeches, also, should not be forgotten, as a valuable means of palliating inflammation. Professor Asalini†, of Milan, has particularly recommended the application of cold washes to contused wounds; and, I believe, the plan is decidedly useful in the first instance, when it is a great object to check the increase of extravasated fluids in the surrounding parts. I think cold applications are also highly proper when contused wounds are disposed to bleed more than usual, and yet no large vessel presents itself as the source of hemorrhage. But in other periods and states of these injuries, I prefer emollient dressings.

If, in lacerated and contused wounds, the surgeon is less frequent ly called upon than in incised wounds to take measures for stopping bleeding immediately after the accident, he finds greater occasion for attending to another important duty imposed upon him in his professional attendance upon wounded persons in general: I allude to the early removal of all foreign bodies and extraneous substances. Cuts are usually made with clean sharp instruments; but contused and lacerated wounds often occur in a manner, which renders them very likely to be complicated with the lodgment of extraneous matter.

---

* Institutes of Surgery, vol. i. p. 66 ed. 5. Philadelphia, 1838.

† Manuale di Chirurgia, 12mo. Milano, 1812.

With regard to lacerated wounds, the same practical remarks apply to them which have been offered on the subject of contused wounds. In warm climates, tetanus is a frequent consequence of them. The stoppage of bleeding, and the removal of foreign bodies having been effected, the edges of the lacerated wound should be loosely drawn together, and retained with a few strips of adhesive plaster, and here and there a suture will sometimes be proper for keeping the flaps and angles duly fixed in their places; for, they ought not to be cut away. Although the union of such a wound cannot be calculated upon to any extent, great benefit results from keeping the parts as nearly as possible in their natural situation. Indeed, in some instances, union does take place through a considerable part of the wound, and this even in severe cases, as exemplified in the man who received a formidable bite from a shark, and the particulars of whom were recorded by Dr. Kennedy.* When a great deal of inflammation ensues, it will generally be advisable to remove the adhesive plaster and stitches, and apply a poultice or the water-dressing; and, if there be much fever, restlessness or delirium, blood-letting, saline purgatives, opium, and very low diet, with proper treatment of the wound itself, are the most likely means to give relief.

Dr. Macartney remarks, "I have never seen an instance of tetanus coming on, where wounds, however severe, and from their nature likely to produce the disease, were healed under water-dressing." He adds, that Dr. Bowyer, a gentleman in extensive practice in Demerara, adopts this method for amputations and other operations; that the wounds are thus healed as favorably as the best treated cases in cold climates; and that, after fourteen amputations, not a single patient had died of tetanus.†

When the surface of a contused or lacerated wound has thrown off its sloughs suppurated, become clean, and evinced a tendency to form granulations, the poultices are to be immediately discontinued, and simple dressings employed. The quallity of these is afterwards to be adapted to the future appearances of the sore, agreeably to the directions already given in the remarks on ulcers: at first, the tepid water-dressing commonly answers exceedingly well.

---

* See Med. Chir. Trans. vol. ix. p. 240.

† On Inflammation, p. 198.

Some contused and lacerated wounds would be inevitably followed by a rapid mortification of the limb, and the patient run the greatest risk of losing his life, were amputation not performed immediately after the receipt of the injury. These are generally examples, in which the soft parts are extensively and deeply wounded, and large bloodvessels and nerves injured. When mortification attacks patients so circumstanced, it is the gangrene which Larry has called *traumatic*, and in which amputation may often be performed with success, though the sloughing has not stopped. The treatment of lacerated and contused wounds, in a gangrenous or sloughing state, must be regulated according to the principles mentioned in the observations on mortification.

OF GRANULATION AND CICATRISATION.

Process by which all Suppurating Wounds and Ulcers are cured. As soon as ulceration ceases, and a sore evinces a disposition to heal, the preponderating action of the lymphatics of the part (or, perhaps, of the absorbent function of the veins) over the action of the nutrient arteries terminates, and the power and functions of the latter vessels are resumed with great activity. They have now something more than their ordinary duty to perform; for they have to fill up the chasm or excavation of the ulcer, produced by the destructive process of ulceration; and to accomplish certain changes, by which the part is brought as nearly as possible into its original state.

This process of restoration is not confined, however, to the consequences of *ulceration*, but is exemplified in the filling up and repair of other chasms, or solutions of continuity, in the texture of parts, formed by the separation of sloughs, or left after the bursting or opening of abscesses. We find it, also, most usefully applied to the cure of wounds, which, in consequence of loss of substance, severe contusion, laceration, too much inflammation, an unfavorable state of the system, or other causes, cannot be united by the first intention, and must unavoidably suppurate. In all these examples, the process of repair and restoration, adopted by nature, is of one and the same description: she heals a suppurating wound exactly in the same manner, and by the same operations, which she avails herself of in the cure of ulcers in general.

One of the principal means for this end is the *production of granulations;* the little conical, or more or less rounded, granular prominences, of a softish new substance, which make their appearance on the surface of suppurating wounds and ulcers, and serve not only for filling up the chasm or cavity, but also for bringing its circumference or sides as much towards a central point or line as the circumstances of the case will allow. The manner in which this is accomplished, and its usefulness, which is much greater, than may at first be supposed, will be presently considered.

The operation by which these new productions are formed, is called the *process of granulation:* by the old surgeons, it was sometimes named *incarnation*. It consists in the formation of numerous granular substances, which originate from all points, and coalesce or meet, proceeding from the circumference towards the centre, and from the bottom towards the mouth of the wound. The result is a tissue of a peculiar character, a *fibro-cellular texture**, constituting the cicatrix.

Granulations consist of a deposit of animal matter, or fibrine, upon the surface of an ulcer or open wound; and into such fibrine blood is soon conveyed. When a wound does not heal by the first intention, it begins in a few hours to be painful, and attended with other symptoms of inflammation. A thin serous discharge oozes out from it, and afterwards the surface gradually acquires a uniform appearance, whatever be the tissues of which it is composed; for they all soon receive a thin covering of coagulating lymph, which at the same time seals up the interstices of the cellular tissue, and has been compared to a delicate pellicle, "somewhat similar to the almost invisible integument of the mucous membrane."† A layer of coagulating lymph having been thus deposited by the vessels of the wounded textures upon the surface of the wound, the next part of the process consists in the growth or extension of minute shoots from those vessels into the coagulating lymph. In fact, they soon begin to enter it, and to deposit the new substance, which is to be converted into granulations. These are likewise rendered exceedingly vascular by the growth of young vessels into them. By Dr. Macartney they are described as composed of a fine cellular membrane, into which bloodvessels proceed from the subjacent tissue. Probably this statement is only applicable to them in their completed state, and not intended to controvert the commonly received doctrine of their formation commencing with the effusion of fibrine.

At the same time that granulations arise, we notice the secretion of pus. There seems, indeed, to be a close and intimate connexion between the two processes, and this is so much the case, that it is not an uncommon belief, that an example of a granulating surface is never seen unattended by the secretion of pus. At all events, this view is generally correct, the circumstances brought forward against it being few, as the appearance of something like granulations between the ends of a fracture examined by John Hunter.

Pus is not, however, secreted from ulcers of cartilages, or the cornea; a fact, perhaps confirming the doctrine, that the morbid changes in the cartilaginous tissue depend upon the action of a vascular new substance thrown out by the synovial membrane.

---

* See Dupuytren, Lecons Oracles pe Clinique Chir. t. ii. p. 3.

† See Macartney on Inflammation, p. 57.

The observations, made by John Hunter, on the process of granulation, are remarkable for their minuteness and originality. He traced, with wonderful patience, the growth and vascularity of the new substance. He frequently noticed a white matter upon the surface of sores and wounds, exactly resembling coagulating lymph: he left it undisturbed, and carefully examined it when the dressings were removed on the following day. He then found that it had become vascular, and that, when wiped or touched with a probe, it bled freely. He ascertained, by experiment, that the same changes take place on the surface of an exposed bone: he scraped one of the bones of the foot, and found, the next day, that a whitish substance with a bluish tinge was deposited upon it, so that the bare bone could no longer be felt with a probe. This substance, which was coagulating lymph, or fibrine, became the next day vascular, and healthy granulations were formed.

Bichat and a few others incline to the opinion, that granulations are productions from the cellular tissue, but, after what has been already stated, I cannot adopt this limited view. Undoubtedly, they may be formed by any vascular texture capable of effusing coagulating lymph.

Every granulation has an artery, which is derived from those of the subjacent original parts: after reaching what may be called the base of the granulation, it divides into numerous ramifications, which then radiate to its surface. However, from the account already given of ulcers in general, we know, that the texture and appearance of granulations vary according to the condition of the sore, and the state of the health. While ulceration is going on, little excavations are perceptible on the surface of the part affected; but, directly the healing process is established, the same surface becomes studded with innumerable small convex granulations, which communicate to it a rough appearance; and the smaller and more pointed these are, the more healthy is their nature. They then generally exhibit a lively red color; their vascularity is considerable; the circulation in them brisk; the secretion of healthy pus from them carried on with freedom; and the sore continues to heal without pain, or inflammation.

When granulations rise much above the level of the neighboring skin, assume a pale color, and a flabby spongy consistence, the circulation in them is languid, they have not the power of forming healthy pus, nor the new skin requisite for the advancement of citatrisation. Neither have these large, high, spongy granulations any disposition to unite with one another, and then contract and shrink, so as to draw the old skin as much as possible over the part occupied by the cicatrix.

But when two surfaces, covered by healthy granulations, are brought together, and kept in contact, they quickly unite, the granulations soon join and inosculate, and the parts become permanently connected.

By the production of pus, granulations are proved to be *secreting organs.* Their sensibility establishes the fact of their being provided with *nerves*, and the development of nerves in them is quite as curious a subject, as the growth, or extension, of vessels into them: they must, indeed, be well supplied with nerves, for the slightest touch of them will give pain.

It is said that, although granulations, which spring from parts endued with great sensibility, are extremely sensitive, such as arise from *bones*, *tendons*, and *fasciæ*, has little or no sensibility, unless these textures be in an inflamed state.

Granulations not only have arteries, veins, and nerves, they are likewise furnished with absorbents. In fact, when unfavorable changes occur in the state of the health, and of the wound, or ulcer, the granulations are frequently absorbed with considerable rapidity. It is in consequence of the presence of absorbents in granulating surfaces, that surgeons are obliged to be circumspect in the use of certain dressings and applications. Cantharides put on an ulcer will affect the urinary organs.

If arsenic, or the bichloride of mercury, be too freely applied to an ulcer, or granulating wound, it will be absorbed, and the patient be as truly destroyed by poison, as if he had taken those deleterious articles into his stomach. Opium is also absorbed from the surfaces of sores, and may thus produce constipation, headache, and lethargic symptoms. I have known several instances of violent and unexpected salivation, caused by the too free employment of salves containing the red precipitate. The absorption of belladonna, when used as an application to irritable ulcers, has been known to bring on amaurosis, or loss of sight from paralysis of the retina. The older an ulcer is, the greater is its disposition to absorb whatever may be applied to the granulations.

How far the veins are concerned in this kind of absorption, and whether they may not do what is usually ascribed to the lymphatics, are points highly deserving of further investigation.

Cicatrisation is that part of the healing process which consists in the formation of the cicatrix or substance composing the scar, which in ulcers or wounds upon the surface of the body consists of the remains of the granulations, a new tissue of a fibro-cellular kind, and the new skin and cuticle covering them. Or, if Dr. Macartney's view be adopted, the term cicatrisation is applied to "the last stage of reparation, in which a wound, or an ulcer, assumes a covering resembling, in some degree, the skin or other adjacent surfaces; for, in no instance, does the cicatrix perfectly possess the structure of the natural tissues." The cicatrix is observed by this gentleman to differ most from the natural structure in those instances where much lymph, or granulations, have been organised, and where these substances have not been sufficiently absorbed, but continue in a callous state, adhering to the neighboring parts, and, probably involving some palpable branches of nerves. Hence, the feeling in the part is, sometimes, so unnatural, that various affections of the nervous and muscular systems may be the consequence.* When the chasm of an ulcer, or the cavity of a suppurating wound, has been filled up with granulations, the next desirable change is the production of new skin, by which they are to be covered. A fine, thin, smooth, bluish, pellicle, gradually extends from the circumference of the ulcer or wound, or from the margin of the sound skin to the centre of the sore, until all the granulations are covered, when the secretion of pus immediately ceases. The sore or wound is then healed; cicatrisation is complete.

The following explanation of this part of the subject by Dr. Macartney seems to me interesting: "As a preparation for the final act of healing, we observe, that the granulations on the edges of the sore are reduced by absorption to a flat surface; the vascularity of the edges about to cicatrise declines; and the thin pellicle, which covered the granulations, becomes opaque and thicker. It is indispensable, also, that inflammation should have ceased in the skin immediately surrounding the sore. The bloodvessels, which previously ascended to the surface of the granulations, now give place to vessels that are extended from the skin to the surface of the cicatrix, in a radiated manner, as may be demonstrated by the injection of the limb with a colored fluid, in a case of recent formation of a cicatrix. These vessels which, at first, form but few cross-communications with each other, ultimately acquire more of the reticulated arrangement of the bloodvessels in the common skin." (P. 61.)

In almost all cases, the pellicle, which precedes the completion of the new skin, is derived from the adjoining old skin, and, consequently, is seen only at the border of the sore or wound; or, rather, it appears as if the surrounding skin communicated a disposition to the nearest granulations to form skin, just as bones give an ossifying disposition to granulations formed upon them. In less common instances, new skin is also produced on parts of the sore or wound situated away from the edges. This may happen when the ulcer or surface of the wound has been very large, and the disposition to form skin at the edges, seems nearly exhausted. Such was John Hunter's view of the subject; but, according to Sir Astley Cooper, an ulcer, or a suppurating granulating surface of a wound, has no power of producing new skin at any point away from its margin, unless some portion or portions of the original skin happen not to have been completely destroyed in places away from the edges of the sore. When cicatrisation takes place under a dry clot of blood, or a scab, Dr. Macartney believes, that it does not proceed from the edges of the wound, but over the whole surface at the same time; the covering being usually detached at once. In this mode of cure he observes, that the cicatrix is pliant, and more nearly like the natural skin than in other instances. He also adverts to certain specific sores, in which cicatrisation may begin, not only at their circumference, but at the same time in other places. "In such cases," he observes, "the healing process is very rapid, and the granulations acquire their proper integument, before there is time for their being diminished by absorption, or by their having assumed a plain surface." Under these circumstances, the cicatrix possesses a very irregular and puckered appearance. The whole of the new substance, by which the chasm is filled up and covered over, presenting a smooth surface and compact feel, is the *cicatrix* or *scar*. The new-formed cutis is less supple, less moveable, and less elastic, than the original skin, from which it also differs in being destitute of those lines or furrows which the cutis naturally exhibits. At first, it is extremely full of vessels; but afterwards both it and the subjacent granulations become less vascular, and the cicatrix, therefore, instead of being, as it is in the beginning, somewhat redder than the rest of the skin, afterwards turns even paler. The new-formed skin, however, always retains a stretched, smooth, shining appearance. Hairs do not grow upon it, and it seems not to be provided with sebaceous glands.

---

* See Macartney on Inflammation, p. 59.

The formation of cuticle is a much easier and quicker process, than the production of new skin; for, while *this* in general only grows at the edges of the sore, *that* may be produced at once from every point of the cutis, as is exemplified in the healing of a blister. It is doubted whether the rete muscosum can be regenerated. Many surgeons consider the fact to be established, because in negroes the cicatrix is at first of a pale reddish color, but afterwards turns as black, or even blacker, than the rest of the skin.

On this point, some valuable remarks were made by Dupuytren. It appeared to him that, in certain burns, when the rete mucosum is merely damaged, but not destroyed, its coloring matter generally becomes much darker than in the natural state: hence the yellow or brown spots occasioned by the scars, and which time cannot efface. In the negro the skin then becomes blacker than in the natural state. When the rete mucosum has been destroyed in some parts, but not in others, the cicatrix has an odd appearance, for the rete mucosum either being not reproduced at all, or reproduced but imperfectly at the points where it has been destroyed, the projections of the cicatrix present a white color, while the points of the skin, corresponding to the places in which the rete mucosum has only been hurt, exhibit a brownish tinge.

While the formation of new skin is going on, the granulations undergo absorption. The whole mass of them, united together as they are in the progress of cicatrisation, is lessened in diameter, the effect of which is to draw the original parts, with which they are connected, nearer together: in particular, the old skin is thus drawn further over the part, and the extent of the cicatrix materially lessened. This contraction of granulations not only takes place during cicatrisation, but for some time after it: hence a scar, which may be at first three or four inches in diameter, will finally be reduced to half or one third of that breadth.

This process is not limited to ulcers and suppurating wounds; it is actively concerned in the obliteration of the cavities of abscesses, the sides of which have thrown out granulations. They will not granulate, however, unless they have burst or been opened.

The healing of wounds by means of suppuration, granulation and cicatrisation, is sometimes called *union by the second intention*, as contrasted with that named *union by the first intention*, which is chiefly applicable to incised wounds. In the processes by which union by the second intention is brought about, there is an increased action of the vessels; and, according to the investigations of Dr. John Thomson, the thermometer applied to the neighboring skin is two degrees higher, than it is when applied to other parts of the integuments.

REPRODUCTION OF LOST PARTS.

One curious question intimately connected with the foregoing subject, is, whether lost parts, or textures, which have been destroyed, can be reproduced? In man, and the higher classes of animals, when an entire part is lost, it cannot be reproduced, which fact is very different from what occurs in some of the lower animals, in which whole limbs are easily regenerated.

The skin and bones seem to be the two textures which manifest in the human body the greatest power of reproduction. Considerable portions of skin, perhaps even with the rete mucosum more or less complete, may be reproduced, and few experienced surgeons have not met with examples, in which the whole scrotum, after having been destroyed from effusion of urine, has been followed by the formation of another. Then, with respect to bones, the whole shaft of a long cylindrical bone, when destroyed by necrosis, is frequently reproduced. Lost portions of the brain and spinal marrow are never regenerated. Muscle is not regenerated; nor are fasciæ. Muscular fibres are united by a substance, different from muscular tissue, but such as restores to the muscle the power of performing its functions. The same is the case with tendon. The cartilages covering the ends of bones, when destroyed, are never reproduced, which, as Dr. Macartney points out, is the more remarkable, since, in what are called *false joints*, the ends of the bones, which rub against one another, become covered with a sort of spurious cartilage. The tissue of nerves is never reproduced, and, if a nervous trunk is divided, the parts, to which its filaments are distributed, are irrecoverably paralysed, notwithstanding the reunion of the divided nerve by means of another kind of tissue. I know, however, that this is a disputed point; and that Mr. Abernethy, as well as Dr. Macartney and others, espouse the doctrine of a true sentient substance being ultimately regenerated in the connecting medium of nerves, which have been divided.

With respect to ligaments, nature can also do a great deal, for, under particular circumstances, she appears to be capable of forming new ones. She has likewise the power of reproducing bursæ mucosæ, and of generating around abscesses and fistulæ a texture nearly corresponding to natural mucous membrane; but, according to Dr. Macartney's investigations, she does not replace any portion of the mucous membrane removed from the stomach or bowels.

GUNSHOT WOUNDS.

So called from the manner in which they are produced, are generally caused by hard obtuse metallic bodies, projected by the explosion of gun-powder from cannons, muskets, pistols, or some other species of fire-arm.

Such bodies may be forced into, or even quite through, the injured parts; or, if the wound be made with a cannon-ball, either the limb may be carried away, or, in other instances, the muscles contused and crushed, the bones broken and comminuted, and the liver or other internal organs torn, while the skin itself remains unbroken, over all this concealed, and sometimes unsuspected mischief.

With gunshot injuries, it is also customary to consider various severe, and often fatal accidents, arising from the bursting of shells, or from the violence with which splinters are thrown about, when a cannon-ball strikes the hull of a ship.

When firearms were first employed for the purposes of war, the component ingredients of gunpowder were not exactly known, and, as the injuries occasioned by it had far more serious consequences than those following common wounds, a suspicion was excited, that the peculiar severity of gunshot wounds depended upon something of a poisonous quality being conveyed into the part with the ball. Another notion was, that the ball was intensely heated, and burnt the parts in its passage through them; an idea that seemed to be confirmed by the observation, that the generality of gunshot wounds threw off sloughs, or eschars, before the healing process commenced. These views are not now known to be entirely erroneous: there is nothing poisonous in the composition of gunpowder; nor are the soft parts burnt by the ball.

All the usual severity of gunshot wounds is referable to other circumstances; the principal of which are:—

First, the hard, obtuse kind of body, with which the injury is done.

Secondly, the immense force and velocity with which the ball strikes against, penetrates, tears, bruises, or breaks the textures which happen to be in its way.

And, thirdly, the nature of the parts injured, which, in consequence of the depth and extent of gunshot wounds, frequently comprise organs of first-rate importance in the animal economy.

Gunshot wounds are, in fact, constantly attended with contusion and laceration, by which a part of the textures, immediately around the track of the ball, is generally in such a state, that it must be thrown off in the form of a slough. It is partly for this reason that gunshot wounds scarcely ever admit of being cured by the adhesive inflammation, but necessarily suppurate. In a few instances, however, especially where the integuments of the face, or neck, or the lip, or scalp, are torn by a ball, union may be obtained with the aid of a suture; but this is an exception to the usual character of gunshot wounds. Indeed, they not only throw off a slough, and suppurate along the course of the ball, but extensive abscesses are frequently occasioned in the neighboring parts. Thus, when a person is shot through the thigh, there will be suppuration in the track of the ball, and not merely in this situation, but generally also between the muscles and under the fascia.

Gunshot wounds, like other contused and lacerated wounds, commonly bleed less freely than incised ones; yet, the hemorrhage is sometimes considerable, and even immediately fatal. When I was serving with the army near Antwerp, a soldier was brought to the Military Hospital, who had received, about ten minutes previously, a musket-ball in the lower part of the neck. He had not been more than two minutes in the ward, when an enormous extravasation of blood, from an injury of the right carotid, near its origin, produced instantaneous suffocation. Not a drop of blood escaped from the wound.

It is computed, that a large proportion of the killed in every great battle perish of internal hemorrhage. In Dupuyrten's clinical lectures, a young man is mentioned, who received a musket-ball in the upper part of the thigh, and died of hemorrhage from the femoral artery, as he was being conveyed from one of the streets of Paris into the Hôtel Dieu.

In deeply penetrating gunshot wounds, a critical period comes on at the end of a week, or ten or twelve days; for, this is the time when the sloughs begin to loosen. It is often impossible to know at first what parts are injured: the extent and danger of the wound cannot be judged of, perhaps, until the coats of some large artery, bowel, or other important organ, touched by the ball in its passage, give way on the loosening of the sloughs. The wound may now become far more complicated than was expected, and profuse hemorrhage, or the effusion of the contents of the bowels, or other viscera, may greatly change the circumstances on which the prognosis is founded. Such bleeding may, indeed, destroy the patient in a few seconds; or the effusions give rise to fatal inflammation within the abdomen or chest. Several days after the receipt of a gun-shot wound, when all the dangers of the first inflammation are nearly over, the separation of a slough may cause hemorrhage from a deep-seated artery. In some cases, the blood accumulates in the abdomen, or the chest; and in others, the patient is carried off in another manner, namely, by profuse discharges of blood from the bowels. The case of a soldier of the 44th regiment, which came under my notice in Holland, in the year, 1814, affords a good illustration of the risk of hemorrhage, about a week or ten days after the receipt of a gunshot wound, the period when the sloughs begin to be loosened. This man had been shot through the ham, and, one side of the popliteal artery having been injured, it sloughed about eight days after the accident, and profuse hemorrhage ensued. A tourniquet was immediately put on, and the femoral artery secured about the middle of the thigh; which operation proved completely successful. The reason for deviating in this instance from the common maxim of cutting down to the bleeding part of an artery, and applying two ligatures to it, will be understood from the observations already delivered on the subject of hemorrhage. The foregoing case is instructive on another point: it teaches us why the separation of sloughs in gunshot wounds often leads to copious and fatal hemorrhage; a remarkable difference from what is seen in common mortification, where the arteries, being plugged up with coagulum, rarely bleed on the detachment of the dead parts. In gunshot wounds, the ball sometimes touches only a portion of the side of a large artery; the slough or ulceration of the vessel is restricted to this situation; and its cavity is neither filled up with a clot, nor always completely occupied by coagulating lymph.

The foregoing remarks chiefly relate to bleedings from such gunshot wounds as penetrate deeply, and are produced by bullets, musket-balls or grape-shot; for the injury arising from the blow of a cannon-ball, is attended with such a degree of contusion and laceration, that a great deal of bleeding rarely follows. We here observe the same thing as is noticed when a limb is torn off by getting entangled in machinery; a limb may be carried away by a cannon-ball, even as high as the shoulder, or upper part of the thigh, without any bleeding of importance, or any necessity for ligatures, either at the moment of the accident, or afterwards, unless amputation be done. We had numerous proofs of this fact during the last war. A soldier of the rifle brigade had his arm shattered to pieces at the battle of Waterloo, as high as the shoulder; yet there was no hemorrhage. A Dutch soldier was brought to the Military Hospital, whose leg had been carried away a little way below the knee, and whose thigh I was obliged to amputate: no hemorrhage preceded the operation. Then, then another remarkable case was brought in the preceding year to the British Field Hospital, at Merxem, near Antwerp: the greater part of the clavicle and scapula, with the whole cushion of the shoulder, had been shot away by a cannon-ball from one of the French batteries, yet no bleeding of importance occurred, and the man ultimately recovered.

The peculiarities of gunshot wounds are numerous: one of them, occasionally noticed, is the gradual loss of the pulse in the injured limb a few days after the accident. One side of the main artery is hurt by the ball, but instead of sloughing, it inflames, and the vessel is rendered impervious by a plug of coagulating lymph.

A gunshot wound may have one or two openings, according as the ball has lodged in or passed quite through the part. When a musket or pistol ball has entered a fleshy part, an apperture is seen rather smaller than the bullet itself, with its circumference discolored by echymosis, and its edge forced somewhat inwards; and, if the ball has passed quite through the part, another larger opening, less contused than the former, is left at the point of its exit, with an irregular and prominent margin.

The direction of a ball or bullet in motion, however quick its course, is readily changed by the resistance it meets with, and the ball then becomes reflected. It should also be recollected that a ball always has two motions; that of a paraboloid curve, and that of a rotation or spinning of it on its own axis. If we had all the data for our calculations, the seemingly extraordinary course which a ball sometimes takes would be completely explicable by the laws of projectiles. In some cases, the points of entrance and exit are precisely opposite one another; but, in others, their relative positions are very different. Dr. Hennen records an instance, in which a musket-ball entered in front of the larynx, and passed all round the neck, nearly to the point opposite that at which it first pierced the skin. When balls strike the ribs obliquely, their course will often be so changed, that they will run almost completely round the body. A similar occurrence is sometimes noticed on the head, where a ball, after having entered at the temple, may be so turned as to pass round the cranium to the opposite side of the head. Facts of this kind are chiefly owing to the great strength and elasticity of the skin. As a soldier was climbing up a scaling ladder, with his arm extended upwards, a musket-ball pierced the centre of the upper arm, and passed over the back of the chest, thence amongst the abdominal muscles, and, having pervaded the glutæi, stopped about half way down the opposite thigh, on the fore part of which it presented itself.

Gunshot wounds are more frequently complicated with *foreign bodies* than any other description of wounds. These may consist of pieces of the clothes, of the ball itself, of fragments of bone, pieces of bomb-shells, splinters of wood, &c.

When there is only one opening, we may infer, that the wound contains a foreign body. There is, however, one exception, which is, when the ball carries along with it into the flesh a pouch of the clothes, which, on being withdrawn, brings out the ball with it. A ball may also stop close to the orifice, and be ejected by the elasticity of the ribs.

In 1814, a French soldier, wounded under the walls of Paris, was brought into the Hôtel Dieu. On examining the upper part of the leg, some pieces of the soldier's dress were observed to be lodged in the tibia. By using force they were extracted. They consisted of a fragment of the soldier's gaiter, which included a musket-ball. An analagous case presented itself at the Hospital la Pitié, in July, 1830: a ball had penetrated the abdomen, carrying before it a piece of the torn shirt, which served very usefully for its extraction.

The opening, made by a ball in the clothes, is always much narrower, than that in the skin. It was the ignorance of this fact, which raised a suspicion that Charles the Twelfth had been assassinated; for the opening, made in his hat by the ball, did not appear to correspond to that made in the skin of his forehead.*

When two appertures are seen, and they have been caused by the passage of one entire ball, it is manifest that this cannot be lodged; yet other articles may be so, such as portions of clothes and splinters of bone; and, occasionally notwithstanding a ball may have produced two openings, a part of it may remain behind, in consequence of its having struck the edge of a bone, so as to be split into two portions, one of which passes out, while the other takes another course and continues lodged. A ball, by striking against a bone, may undergo different changes in its shape, be flattened, or split into fragments, so as to produce mischief very difficult to account for. A ball enters the lower part of the right leg, and strikes against the spine, or sharp edge of the tibia, whereby it is cut into two fragments. These fragments, then diverging a little, pass through the calf of the leg and lodge in the fleshy part of the other leg, which happens at the moment to be behind the other limb. Thus five openings may be caused by one and the same ball. Balls, by striking against iron bars, may be split into fragments, which then enter the body of the wounded person. Dupuytren saw many cases of this kind at Paris, during the disturbances in July, 1832.*

---

* See Dupuytren's Leçons Orales, &c. t. ii. p. 426.

It was once a disputed point, whether the cylindrical bones could be fractured longitudinally. This question is now completely settled. I saw several examples of this kind of injury, which were brought into the hospital at Oudenbosch from Bergen-op-Zoom. They often extend the greater part of the length of the thigh bone, or tibia, and sometimes run into the knee, followed by inflammation of the synovial membrane, and ulceration of the cartilages. Where such mischief does not ensue, it is an exception to the general course of things. In University College museum, there is one excellent specimen of a fracture of the tibia, extending into the knee, and united very well. The frequently considerable extent of longitudinal fissures in the cylindrical bones from gunshot violence should be constantly recollected, when amputation is about to be performed; for, it may be necessary on this account to make the incision and saw the bone several inches above the place where the ball entered the limb. A case of longitudinal fracture of the femur, from the passage of a ball into the popliteal space, is recorded, in which the fissure extended from the internal condyle to the upper third of the bone, unattended with crepitus, and allowing the patient to stand up after the injury. It proved fatal on the fifth day.*

Some of the worst *compound* and *comminuted fractures*, ever seen in the practice of surgery, are those arising from gunshot violence. They are not only frequently complicated with extensive laceration of the soft parts, wounds of the nervous and arterial trunks, but with a degree of comminution and splintering of the bones, rarely noticed in any common examples of such injuries. It is also one peculiarity of gunshot injuries, that they sometimes cause a compound fracture, and dreadful laceration of the hip and shoulder joints, which are hardly capable of being so injured by any other means. What in fact is likely to cause a compound fracture of the head of the humerus, or femur, but a gunshot wound?

In gunshot wounds, the *prognosis* depends chiefly upon the extent and depth of the injury, and the nature of the wounded parts. Wounds of the head, lungs, bowels, considerable arteries, and large joints, extensive contusion and laceration of the soft parts, the dreadful degrees of concealed mischief often resulting from what are erroneously termed *wind contusions*, and all badly comminuted and compound fractures, may be pronounced to be accidents of the most dangerous kind.

I have slightly alluded to the true manner, in which what are called *wind contusions* are produced. A cannon-ball, especially when nearly spent, frequently strikes the surface of the body, or limb, obliquely, and is reflected without breaking the skin. A soldier may be killed in this way without any appearance of external violence. His comrades suppose, therefore, that he has been killed by the wind of the ball. But the error of this opinion is immediately manifest, when it is remembered, that cannon-balls often carry away parts of the dress, without doing any harm to the person. I remember a case, where a cannon-ball passed amongst the six legs of three officers walking together arm in arm; yet both legs of the officer in the middle escaped injury, while one leg of each of the outside parties was so shattered as to require immediate amputation. When a cannon-ball rolls, as it were, over the surface of the body, or, a limb, the toughness and elasticity of the skin keep it entire, while the muscles and even the bones may be crushed to atoms, or the viscera and internal vessels of the chest, or belly, fatally lacerated and disorganised. Hence, when these wind-contusions do not immediately kill, as they often do when the abdomen or thorax is implicated, they are, at all events, to be regarded as examples of the most violent forms of gunshot injury.

---

* Leçons, &c. t ii. p. 429.

† See Alcock, in Lond. Med. Gaz. No. for June, 1839, p. 326.

In July 1830, at Paris, a woman's humerus was completely crushed by a cannon-ball, though the skin remained entire; and, in 1814, a soldier was brought to the Hôtel Dieu with his kidneys pressed to atoms, though nothing particular was noticed in the loins but a considerable swelling, the integuments being unbroken. Sloughing ensued; and after death the crushed state of the kidneys and posterior part of the spine was detected.*

The violent contusion and laceration of parts, the several complications of fractured bones, foreign bodies, wounded arteries, and lacerated nervous trunks, are events fully accounting for the severity of the consequences of many gunshot wounds, comprising dangerous degrees of inflammation and sympathetic fever, enormous abscesses, mortification, and the frequent loss of limb or life.

With respect to the *immediate effects of a gunshot wound on the system at large*, they vary in different subjects, even with the same kinds of injury. Of course, the results of profuse bleedings will be nearly alike in all individuals, and death be often suddenly produced by such as occur from vessels of large size within the thorax or abdomen. Some men will have their limbs carried away by a cannon-ball, without betraying at first the slightest symptom of mental or corporeal agitation; others will be seized with faintness, vomiting, shiverings, a deadly paleness, and syncope, from injuries of only a trivial kind. When this is the case, the disturbance and depression of the system may generally be removed by giving the patient a little wine or other cordial, or a few drops of laudanum, and by assuring him of his safety.

However, the long continuance of the foregoing class of symptoms ought to raise suspicions of internal hemorrhage, effusion in one of the great cavities of the body, injury of important viscera, or other serious mischief.

---

* Dupuytren, op. cit. t. ii. p. 436.

After the subsidence of the alarm, frequently excited in the animal economy by a gunshot wound on its first reception, a reaction follows, or that of the constitution, which is described under the name of sympathetic inflammatory fever. This will afterwards abate as the effects of the inflammation diminish: or, if these go on unfavorably, it may change to hectic, so as either to destroy the patient, or render the removal of the injured part necessary for his preservation.

TREATMENT OF GUNSHOT WOUNDS.

If the injury be in one of the limbs, the first thing is to decide whether the wound is such as to require amputation, or whether an attempt can prudently be made to save the part. The decision is generally one of vast importance, because, if the injury be sufficiently bad to make the chance of preserving the limb hopeless, the operation ought to be performed *without delay*, and the opportunity of doing it, if now neglected, may never return. Violent inflammation, suppuration, and profuse abscesses, phlegmonous erysipelas, and even a rapid mortification, attended by the utmost disorder of the whole system, may come on, and the patient thereby be placed in a condition, presenting little or no prospect of recovery, whatever be attempted.

In many gunshot wounds, the stoppage of bleeding, and the removal of foreign bodies, constitute the two earliest indications. With respect to hemorrhage, the rule is also to be observed, which applies to wounded arteries in general, viz. that of exposing the wounded part of the artery, if circumstances admit of it, and putting one ligature on the upper, the other on the lower orifice or portion of the bleeding vessel. To instances of profuse hemorrhage from the limbs, directly after the receipt of the injury, this rule is strictly applicable; but not so to many examples of secondary bleeding, where the artery and neighboring textures are in a state of inflammation, suppuration, and sloughing; the parts incapable of bearing further disturbance; and the artery indisposed to heal, if it were tied, which, under these circumstances, is often a difficult, or impracticable, thing. Here the principles laid down in the remarks on hemorrhage and compound fractures, are to be acted upon, and especially with reference to secondary hemorrhage from the tibial arteries.

The application of a ligature to the brachial artery, for wounds of the radial and ulnar, often fails from the freedom of the anastomoses with the recurrent arteries. An instance of such failure, on the third day after the operation, is given by Mr. Alcock, It was formerly the custom to dilate the orifices of all gunshot wounds with a curved bistoury. This was done, first, to facilitate the extraction of foreign bodies; secondly, to lessen the tension and constriction of the parts; thirdly, to diminish the inflammation by procuring an evacuation of blood; and, fourthly, to make a ready outlet for any purulent matter which might be formed. The practice should not, however, be adopted without discrimination.

John Hunter observed that, when an incision was made at the orifice of a gunshot wound, it generally healed up in four or five days, leaving the parts just in the same state as if the knife had not been employed at all. Some gunshot wounds it would be highly inexpedient and dangerous to dilate, as, for instance, those of the abdomen, the doing of which would occasion exposure and protrusion of the viscera.

In general, British surgeons only dilate the orifice of a gunshot wound when some clear and determinate object can be accomplished by it; as when balls, splinters of bone, or other foreign bodies, are to be extracted, a freer outlet is required for purulent matter, or sloughs; or ligatures are to be applied to a bleeding artery; or the inflamed parts are tightly compressed by an unyielding fascia. Whenever a ball has entered a part which is likely to get into this condition, the usefulness of dilatation in the first instance is yet strongly insisted upon by some authorities.

1. In whatever region of the body a gunshot wound is to be dilated, it is more frequently required for the opening by which the ball has made its exit; because whatever extraneous substances have been formed by the splintering of bones, or carried into the part by the ball, are most likely to lie in this direction.

2. Another general rule is to dilate more freely the opening which, in the patient's usual position, will be most depending.

No doubt can exist about the propriety of *removing foreign bodies* as soon as it is practicable, without too much irritation of the parts; and, on this condition, not only is the plan right of making a dilatation of the orifice of the wound, but even of practising other deeper incisions. Indeed, as inflammation has not yet come on, the proceedings for the purpose are much less painful immediately after the accident, than at a subsequent period. But we should only resort to this method when the foreign bodies can be found with certainty, and extracted with tolerable facility. Their precise situation is frequently unknown; and, on other occasions, even when it is known, they may be so firmly fixed, or so deeply lodged, that the measures, necessary for their removal, would be productive of far greater mischief, than would result from their continuance.

The generality of British military surgeons make it a rule only *to remove at first* those *foreign bodies which are near the external opening or are superficial*, and can be taken out without too much pain and irritation; or, if they meddle with others deeply placed, they do so only when compelled to it by the urgency of symptoms excited by the pressure of such foreign bodies on organs of importance. Thus a ball lodged under the skull, upon the surface of the dura mater, may produce such compression of the brain as will justify any operation calculated to enable the surgeon to extract the offending body. As for others deeply and firmly lodged, but not attended with such urgency, they often become loosened and get nearer the surface after suppuration has taken place, or the sloughs have been detached. Something, however, will depend upon the kind of foreign body; rough angular substances, broken and irregular shaped masses of lead, loose splinters of bone, and portions of the clothes, creating more irritation than a smooth leaden ball, and therefore more urgently requiring to be extracted. Smooth, round, leaden balls sometimes lie in parts for an indefinite time without occasioning much inconvenience. Adhesive inflammation forms a cyst for them, by which they are separated from the neighboring textures. Between such a cyst and the foreign body, there is a small quantity of serous fluid.*

Balls do not, however, always remain thus stationary; sometimes, in the early stage of the case, they change their place rapidly. Hence, it is not warrantable to practise an incision for the extraction of a ball, whose situation has not been made out directly before the operation. Balls mostly travel towards the surface, less rarely towards the central parts of the body.

No surgeons of the present time entertain any doubt, that Mr. Hunter was too timid in his precepts relating to the extraction of balls from gunshot wounds. This observation applies particularly to his advice, "that, where the ball lies so remotely from the skin, that it can only just be felt, and the skin itself is quite uninjured, no counter-opening ought to be made." In opposition to this plan, the following maxim has been inculcated:—If the ball can be felt, it matters not what depth of muscular parts may intervene, it should be extracted, and the necessary incisions made for the purpose. In one fatal case, where the ball was lodged deeply under the muscles of the calf, where it could be felt with a probe, Mr. Alcock regretted that he did not at once extract it by a free incision directly through those muscles, down to the foreign body.† He gives also another case, in which a ball lay imbedded in osseous matter between the radius and ulna. "This wound, after many weeks' treatment, produced a permanent twisting downwards, and contraction inwards, of the hand, so as to render it not only useless, but exceedingly inconvenient; and, all measures failing to prevent or amend it, the arm was amputated. But, says this gentleman, had the ball been discovered and extracted in the first instance, I have little doubt, that a useful hand might have been saved." Not knowing the exact state of the limb, I can offer no opinion on what might have been the result of such a proceeding in the subsequent stage of the case; but it is clear to me, that these and numerous other facts prove that the practice of extracting balls is more limited than it ought to be.

---

* Dupuytren, Leçons Orales de Clinique Chir. t. ii. p. 483.

† See Med. Gaz. New Series, No. 31.

For the extraction of balls, bullet-drawers and forceps of particular construction are sometimes employed; but the fingers and common forceps are generally the best instruments. Balls sometimes pass nearly through parts, and then lodge under the skin: here they should be cut upon, and removed.

Dupuytren makes useful practical distinctions between the different kinds of splinters; and particularly notices such as still retain a connexion, and may live and beneficially contribute to promote the repair of the fracture; and others, which are completely detached, either in the first instance, or afterwards, and are to be regarded as foreign bodies. On the same point, Mr. Alcock proposes two maxims: 1. Since fragments, particularly long and irregular ones, generally in contact at one or more points, will not only unite in a firm and perfect manner, but serve as a useful connecting link to the shafts; since, moreover, such fragments have extensive adhesions to muscular fibres, and, if deeply placed, cannot be extracted without a good deal of dissection, and some violence, this operation, under such circumstances, ought never to be attempted. 2. A completely detached and short fragment should be removed at once, if it can be done without much dissection or violence, as it is likely in a few hours to become dead, and act as a foreign body.*

Military surgeons differ respecting one particular case, which is *when a ball penetrates and lodges in the spongy part of a bone.* Baron Larrey only sanctions the attempt at extraction when the ball is actually producing dangerous effects: some other surgeons, on the contrary, deem it right always to try to extract it without delay, apprehending that its presence will bring on necrosis, abscesses, sinuses, and that the diseased state of the limb will be likely to continue for years. Much must depend upon the precise situation of the ball with respect to the wound in the skin, and whether it be deeply impacted, or only partially buried in the head of the bone. If plainly perceptible, not too deeply buried in the cancellous structure, and it could be got at without cutting through a great thickness of soft parts, or injuring the synovial membrane of a considerable joint, the extraction of it would be the most advisable practice. Such a case, attended with severe effects, and not admitting of extraction of the ball, might justify the excision of the head of the humerus, or the parts of some other bones, in which the ball had lodged.

Superficial, light, unirritating dressings are now generally preferred as the first application to gunshot wounds. On the field of battle, indeed, it would be well for many of the wounded if the surgeon, after paying attention to *hemorrhage* and the *removal of foreign bodies*, were to be content with applying simple pledgets, and covering the parts, if the weather were not too severe, with handkerchiefs or linen wet with cold water. The hasty and indiscriminate employment of tight straps of adhesive plaster, and tense bandages, has cost thousands of soldiers their limbs or lives. Dupuytren insists upon the usefulness of keeping gun-shot wounds excluded from the air. He applies to them fine old linen, with numerous apertures cut in it. This is covered with cerate, and put on the part. Over the pledget is laid charpie, which is preferred by the French to lint, as being more calculated to imbibe the discharge. Instead of a roller, the application and undoing of which cause great disturbance, Dupuytren preferred long widish pieces of linen, which were made to cross over the wound, and then pinned.

---

* See Lond. Med. Gaz. New Series, N. 33. p. 240.

One of the most eligible applications for gunshot wounds is the common tepid water-dressing, covered with a piece of oiled silk; or pledgets of simple ointment, poultices, and fomentations. In the suppurative stage, poultices and fomentations are very generally employed. They are decidedly the best applications when a slough is present, or matter is forming; previously to which states, that is to say, during the first two or three days, cold lotions are sometimes preferred. Cold evaporating washes and cold water are not to be applied, however, when the temperature of the part or limb is lower than natural, the circulation in it languid, the weather cold, and the patient particularly exposed to it. Such practice might bring on mortification.

The early stage of gunshot wounds generally requires antiphlogistic treatment. As soon as inflammation comes on, venesection, leeches, aperient medicines, and low diet are indicated. Wounded soldiers, being subjects thrown from a state of full health into one of considerable danger, are sometimes conceived not to thrive so well under a system of starvation as other individuals laboring under an equal degree of inflammation. Whether this idea be correct, I cannot undertake to say; but in regulating the diet some allowance should be made for habit. The wounded Cossacks, brought into the Hôtel Dieu in 1814, were observed by Dupuytren to eat with impunity ten times as much as a Spaniard in health. In many cases, the free use of the lancet is the chief means of saving life; this fact is exemplified in wounds of the chest, attended with injury of the lungs, in those of the abdomen, accompanied by injury of the viscera, and in gunshot injuries of the head, where the effects extend to the brain and its membranes.

In such examples, particularly, as well as in all others in which the inflammation is likely to be severe and dangerous, on account of its extent or situation, venesection, leeches, and the most powerful antiphlogistic means must not be omitted. As for bleeding, both with the lancet and leeches, it must be carried to the degree required by the urgency of circumstances.

When the course of a ball is such as to create risk of secondary hemorrhage, on the loosening of the sloughs, that is, between the sixth and fourteenth days, the surgeon should be upon his guard, and direct the patient to be at this time closely watched, and preparation made for the immediate suppression of the bleeding.

The first dressings should not be removed before the fourth or fifth day, unless tight bandages, stiffened with blood, cover and conceal the parts, when, perhaps, the sooner they are removed the better. With this view, they should be moistened with warm water, and cut off with as little disturbance of the wound as possible. About the fourth or fifth day will be quite early enough for the removal of the rest of the dressings, unless excessive pain, or sudden hemorrhage, should render an earlier change of them proper. Dupuytren used not to remove the first dressings before the fifth, sixth, or seventh day; but, in order to prevent unpleasant effluvia, he took away the outer pieces sooner, and wetted the remainder with a solution of the *chloride of soda.*

When gunshot wounds *suppurate* or *slough* to any great extent, they are to be treated according to the rules laid down with reference to *abscesses* and *mortification.*

When complicated with *hospital gangrene*, we are to adopt those measures, which were advised in the observations delivered on that formidable disease. Baron Dupuytren's report of the effect of the chlorides upon it does not agree with that of Lisfranc; for he finds them ineffectual in stopping it, and a solution of mercury in nitric acid is what he prefers.

When complicated with *broken bones*, gunshot wounds are to be treated on principles applicable to compound fractures.

When complicated with *tetanus*, the practice should be regulated by considerations which will be noticed hereafter.

Sometimes, after a bad gunshot wound, particularly one attended with a shattered state of the bones, has suppurated, the case, instead of taking a favorable course, proceeds from bad to worse; large, extensive, and repeated abscesses form; the matter spreads, not only under the integuments, but between the muscles and under the fascia. One collection of matter is no sooner discharged, than another presents itself. Fragments of bone keep up incessant irritation; the fracture sometimes unites partially, sometimes not at all; the bone may be attacked by necrosis; the patient has hectic symptoms in an urgent shape, profuse night sweats, a small quick pulse from 130 to 160; no appetite, little sleep, and great emaciation, with perhaps frequent vomiting, or colliquative diarrhœa. Under such circumstances, a further perseverance in the attempt to save the limb would only terminate in the loss of the patient's life. On the contrary, by removing the limb, the constitutional derangement may often be checked, and the patient saved.

Amputation may also become indispensable, secondarily, in consequence of traumatic gangrene, which so often follows gunshot injuries, complicated with fracture or a wound of an arterial trunk. Here the practical rules are, not to defer the operation till the red line of demarcation has been formed, and to make the incision in sound textures.

Amputation may also be required, secondarily, when a gunshot wound of an alarming kind becomes complicated with secondary hemorrhage, not admitting of suppression by the ligature of a principal artery at some distance from the wound itself; for, besides the difficulty of finding the bleeding part of the artery in the midst of the diseased textures, the sloughs, matter, and blood around it, the ligature, if the vessel should admit of being tied, would be of no avail, in consequence of the artery itself being in a diseased state.

CASES DEMANDING AMPUTATION DIRECTLY, OR SOON AFTER THEIR OCCURRENCE.

1. When a considerable portion of the whole thickness of a limb has been carried away by a cannon-ball, or the explosion of a bomb. Exceptions occur where the ball has taken off the arm close to the shoulder or at the joint itself, together with the accromion or coracoid process, and spine of the scapula. Here no parts would be left, on which the operation could be done. The same remark applies to other examples, in which the thigh is torn off at the hip. In such cases, we should free the wound from all extraneous substances, whether splinters of bone or other things, and stop bleeding if it be going on, or, even if it be not, we should imitate Dupuytren, and tie the exposed mouth of the principal artery, in order to prevent it. Yet it is impossible to extricate the patient from many serious dangers, as those of the shock of such an injury on the system; or, if he get over these first perils, he will still have to encounter all those of violent inflammation, and profuse suppuration; the difficulty of healing the stump; and the risk of inflammation of internal organs; an event as formidable as it is common.

2. When bones are much shattered, and the soft parts severely contused, lacerated, or torn away. If a bone were fractured only in one or two places, the splinters not being numerous, the chief vessels and nerves not being touched, and the soft parts not severely injured, an attempt ought to be made to save the limb; but, in the contrary circumstances, amputation should be performed without delay. These are, however, to be received as general rules, founded on the average of the terminations of numerous cases; and

not either upon the absolute impossibility of cure, or the certainty of recovery of each description of injury in individual examples. Many patients with wounded limbs, condemned to operation by the nature of the injuries, refuse to submit to amputation, and yet recover. Still, they frequently gain little advantage from such refusal; for, after having passed through all risks, long protracted hectic disorder, and undergone innumerable painful operations for the discharge of abscesses, and the extraction of broken or dead fragments of bone, they usually remain with a broken constitution, a shortened mutilated limb, deep adherent cicatrices, and a member that is only an incumbrance.

3. When a cannon-ball tears away a great mass of the soft parts, leaving the rest badly torn and contused, the principal artery or arteries being at the same time wounded, though the bone itself may not be broken, immediate amputation is necessary.

4. An injury of the femoral artery, with fracture of the thigh bone, is another case for immediate amputation. However, Baron Dupuytren does not admit the necessity for the operation when the femoral artery is wounded, unless the fracture be a severe one. If secondary hemorrhage were to occur, this event, together with the diseased state of the limb in such stage of the case, would generally call for amputation.

5. If the main artery and vein of a limb be both injured by gunshot, the safest practice is to amputate without delay for the prevention of mortification and its usual fatal result.

6. Fractures from grapeshot wounds, with laceration of the muscles, and one or more of the principal nerves, without injury of the main artery, is a case for prompt amputation, as is exemplified when a cannon shot strikes the thigh, and carries away the muscles of the posterior part of the limb, together with the great sciatic nerve. The mere division of this nerve, however, without extensive laceration of the soft parts, would not require amputation. Cases are recorded where a gunshot injury of a nerve has led to the bulbous enlargement of the end of it, productive of severe suffering on the slightest action of the muscles, or pressure, and requiring the tumor to be removed. Mr. Alcock gives one example, in which such change took place in the anterior tibial nerve, and where relief was obtained by excision of the bulbous swelling.

7. Certain injuries, formerly termed *wind contusions*, where muscles, bones, vessels, and other textures are crushed, though concealed under the skin which remains entire. Here an incision is first to be made for the purpose of ascertaining the reality of the hidden mischief. When the bones are comminuted, the muscles disorganized, and the large vessels wounded, amputation is indispensable. But, if the vessels and bones have escaped, and the muscles are the parts chiefly injured, amputation may be deferred.

8. Gunshot wounds of the large joints, especially of the knee,

are universally recognised as producing the necessity for amputation. Amputation is necessary when a ball has passed through the spongy part of a bone, near a large joint, or through the joint itself, especially when the synovial membrane is extensively opened, and the comminution considerable. However, in fractures of the head and neck of the humerus, with not too extensive an injury of the soft parts, extraction of the broken part of the bone is preferable to amputation.

9. Gunshot fractures of the two upper thirds of the thigh bone, or of its neck, are generally deemed proper cases for immediate amputation, or, more correctly speaking, as soon as the patient has rallied from the faintness or depression often caused by the shock of such an accident. Fractures of the lower third is a disputed case, unless much comminuted, and the soft parts are severely lacerated.

10. A ball lodged in the articular head of the bone, or so placed in a joint as not to admit of extraction. Perhaps, in some cases of the first kind, it would be better to remove the head of the bone. The excision of the elbow joint, if much shattered, is a justifiable and often successful proceeding, and, if adopted without delay, may be the means of saving the limb. The excision of the knee, I regard, under any circumstances, as an unwarrantable measure.

11. Fractures of the patella, unless accompanied by great comminution, or a large opening in the synovial membrane, will admit of delay.

12. Injuries of the forearm by a musket-ball, however severe, rarely forbid the attempt to preserve the limb; and, if amputation become necessary, it may be performed after the chance of saving the limb has been taken. These remarks apply even to badly comminuted fractures of both radius and ulna.

13. Extensive denudation and concussion of a bone by a small cannon-shot, or piece of bomb-shell. In this case, the medullary texture suffers injury, and the muscles are contused and lacerated, the limb insensible, the foot cold. Here mortification will be sure to follow, unless anticipated by the operation. This case is chiefly seen in the leg, where the tibia is superficial.

14. When two limbs are injured in a severe and irrecoverable degree, both ought to be amputated without delay. Convalescents from gunshot wounds should return to a full diet, and the use of wine and beer, very gradually. For some time after the cure, there is a strong tendency to inflammation of internal organs. According to Dupuytren, this fact was particularly exemplified a few years ago, at the Convalescent Hospital, at St. Cloud, near Paris, where, in consequence of the wounded receiving too liberal a supply of delicacies, wine, &c. from charitable and patriotic individuals, many of them, after having got through the danger of severe forms of gunshot violence, fell victims to inflammations of the viscera.

POISONED WOUNDS.

As poisoned weapons are not made use of by civilised nations, and venomous animals are not numerous in this country, our opportunities of seeing poisoned wounds are but limited. Still, the bites and stings of insects, the pricks and cuts received in dissection, the bites of adders, and those of rabid dogs, cats, foxes, and, on the continent, of wolves also, form together a subject highly interesting.

With regard to the stings of wasps, bees, and hornets, they may bring on severe consequences in unfavorable states of the constitution. Professor Gibson gives the case of an elderly lady, who died in a quarter of an hour from the indisposition occasioned by the sting of a wasp. Although the sting of a single bee or wasp is not generally of much consequence, fatal effects have often been known to result from an attack of a swarm of them. A sting on the eye is also alleged to be productive of a most violent form of ophthalmia. Inadvertently swallowing a bee or wasp that happens to be in beer, or other fluid, may prove fatal. Dr. Gibson has recorded an instance of death from a bee being accidentally swallowed that happened to be in a piece of honeycomb. The recovery of one person is mentioned in the Dict. des. Sciences Méd. who took directly after the accident a copious draught of common salt and water.

The bite of the *mosquito* sometimes leads to troublesome ulceration. Dr. Dorsey records one example of fatal gangrene from such a cause.

Spiders have long been considered as venomous; but the opinion, I believe, is only correct in relation to some of them; nor can any of them be said to produce the severe effects formerly ascribed to them. Even the bite of the tarantula, common about Naples, has not the aggravated consequences often depicted. In Martinique, as we learn from Moreau de Jonnés, there is an enormous spider that destroys small birds and reptiles.

The *scorpion* is another venomous insect of warm climates. The largest, the scorpio afer, inhabits India, Persia, and Africa. Its poison is contained in a reservoir near the tail, and poured out of two minute apertures at the extremity of the sting. The late Mr. Allan had opportunities of observing the effects of its bite on the crew of La Diana, a French frigate, taken into our service, and abounding with scorpions, which, though quiet and torpid in our climate, became very active and troublesome on the vessel returning to a warm station. The sting was always followed by violent and extensive inflammation, swelling, and pain; but Mr. Allan never knew any dangerous constitutional disturbance excited.

The best application to the stings of bees and wasps, and the bites of gnats and mosquitoes, are a solution of muriate of soda, the liq.

ammon. subcarbonatis, a solution of acetate of lead in rose water, or tincture of opium. Were the stings numerous, bleeding, purging, and a strict antiphlogistic regimen would be necessary.

In Morocco, where scorpions are numerous, the favorite antidote is alive oil. A ligature is first applied above the part: the sting is then cauterised and rubbed with the oil. If I were to meet with such a case, I should be inclined to apply a cupping-glass; for Sir David Barry's experiments prove that, when the pressure of the atmosphere is thus removed, absorption is immediately stopped.

Bites of venomous snakes. In Europe, the adder, or viper, is the most venomous reptile. Its poison is lodged in capsules at the roots of two moveable fangs in the upper jaw, which, when the animal bites, are directed downwards, and the poison is then compressed out of the poison cysts, and passes along grooves in the fangs into the wound. In this country, the bite of an adder rarely proves fatal to an adult. According to Fontana, the danger of the bite is generally in proportion to the smallness of the animal bitten. Hence children suffer greater indisposition, and more frequently die from the injury, than grown-up persons. The poison of vipers operates also with unusual peril on animals already weakened by disease. It is most active in hot weather, has greater effect when the circulation is quick, or when the bite happens through a vein, or in a part near the source of circulation.

Much will also depend upon the quantity of poison in the capsules, and the depth to which the fangs have penetrated. The strength of the venom is particularly great in the procreating season of the reptile.

The effects of the bites of all venomous snakes take place with great rapidity. An acute pain and burning sensation are instantly caused by the bite of a common adder, followed by rapid swelling, and a livid discoloration of the part. These effects extend to a considerable distance, indeed frequently to the whole limb, on which livid spots, or an appearance of ecchymosis takes place. This rapid swelling is caused by the effusion of serum into the cellular tissue, like what occurs in diffuse inflammation of that texture from other causes. The constitutional effects are, giddiness, extreme prostration of strength, depression of spirits, faintness, syncope, small quick irregular pulse, difficulty of respiration, profuse, cold, clammy sweats, confusion of vision, headache, vomiting of bilious matter, a general yellow tinge of skin, and vast pain about the navel. When the case ends fatally, a rapid and extensive gangrenous affection of the cellular tissue is usually noticed.

In the *treatment of the bites of venomous snakes*, two indications present themselves:—

1. To endeavor to prevent the passage of the poison into the system.

2. To resist and lessen its operation on the constitution after it has entered the circulation.

For fulfilling the first indication, the following means are proposed:—

1. Excision of the bitten part, or destroying it with caustic. The bite of an adder, however, rarely produces severe effects enough to justify such proceedings, and, unless the excision were to go beyond the depth of the fang, it would be likely, as Sir D. Barry conceives, to do harm by exposing the mouths of larger vessels to atmospheric pressure.

2. The application of a ligature or tourniquet.

3. Suction. In Sir D. Barry's experiments, several dogs and rabbits were bitten by vipers. To the bites of some he applied cupping-glasses; to the bites of others he did nothing. Now, although the animals left to their fate did not ultimately perish, yet they were invariably attacked with convulsions and stupor, and the dogs with vomiting; whereas, when the cupping-glass was applied for half an hour to those which had been bitten by one, or even two or three, vipers, they suffered no bad symptoms whatsoever, and exhibited no mark of constitutional poisoning. Sir D. Barry is not an advocate for scarifications. The ligature, and simple washing of the part, and exclusion of it from the air, are the only measures which he approves of before the cupping-glass is applied; and even then only when suction, or the action of the cupping-glass cannot be immediately obtained. When a cupping-glass has been applied an hour, the contents of all the vessels will have taken a retrograde course; a stagnation of fluids will be the consequence, and the absorbent faculty of the cupped surface suspended. Thus, according to Sir David Barry, by letting the first cupping precede excision, we may remove some of the poison, and lessen the chance of the remainder being taken into the system.

4. The next proceeding is excision, which is to be followed by a second cupping. It may not, indeed, be necessary to employ excision at all for the bite of an adder. What I am now explaining relates rather to the severer description of poisoned wounds, and especially to the best mode of preventing the fatal consequences of the bite of a rabid dog, cat, or fox.

5. In such cases, the part having been cupped, cut out, and cupped again, the cautery, or a powerful caustic, which will hermetically close the mouths of the vessels, may be employed, as advised by Sir David Barry.

6. Specific effects have been ascribed to certain local applications in rendering the poison inert; as, for instance, to olive oil, to the liq. ammoniæ, and eau de luce. Their inefficacy was, however, completely demonstrated in France, by Hunaud and Geoffroi.

With regard to *constitutional treatment*, ammonia and arsenic have the strongest evidence in their favor as internal medecines.

L'eau de luce, once regarded as a specific, consists of ammonia with a small proportion of amber, and therefore resembles the spir. ammon. succinatus. Ammonia may act usefully in preventing syncope and depression of the vital powers, but is not a specific. Persons under the influence of the poison of serpents, or affected with hydrophobia, or tetanus, are capable of bearing extraordinary doses of this and other powerful medicines, such as opium and arsenic; which last has, perhaps, more evidence in its favor, as an antidote for the bites of snakes, than any other article. The doses of liq. arsenicalis, given every half hour, by Mr. Ireland, to soldiers in the West Indies, bitten by the colluber carinatus, contained one grain of arsenic. He combined with this treatment purgative clysters, and as soon as purging and griping commenced, the arsenic was discontinued.

In South America, the plant Mikania guaco has high reputation for its virtues in these cases, though probably its power is exaggerated; and, in fact, there are many causes of deception. The bites of some snakes get well without any particular medicines. The bites of serpents in general are very unequal in their effects, according to the season of the year, the temperature of the air, the empty or full state of the poison bags, and the strength, health, and size of the animal bitten. Instances occur, both among the Indians and the white people, who inhabit the mountainous and thinly settled parts of the American states, of almost instantaneous death from the bite of the rattlesnake. On the other hand, many others undergo very trivial indisposition from a similar injury. The entrance of a fang into a vein is stated to be inevitable and quickly fatal. There was a man, a few years ago, in St. George's Hospital, who had been bitten by a rattlesnake. He was not destroyed so quickly as some accounts of the rattlesnake would lead us to suppose. There were two wounds on the back of first phalanx of thumb, and another on the forefinger. The hand soon began to swell, and, in ten or eleven hours, the whole limb, armpit, and shoulder were very cold and enormously swoolen. All the surface of the body was indeed remarkably cold. At this period, the mind was collected; but, immediately after the accident, there had been some incoherence. From the armpit, the swelling extended down the side, with extravasation of blood in the loins, giving them a mottled appearance.

The temperature of the body now rose, repeated faintings ensued, vesications made their appearance in several places, a large abscess formed on the outside of the elbow, and discharged half a pint of reddish matter. Sloughing in the axilla, on the forefinger, and at a few other points, ensued; and death took place on the eighteenth day, when the original bites had entirely healed. The body, on dissection, exhibited no remarkable morbid changes, except the mischief in the arm.

Of punctures and cuts received in dissection. Whether the bad consequences resulting from these injuries should be referred to the insertion of a poisonous matter in the part, or to the effect of the simple mechanical injury in particular states of the constitution, is a question yet unsettled. The common belief is, that such consequences, at all events, sometimes depend upon the introduction of a poisonous or deleterious principle into the wounded part, and this view I am disposed to deem correct, for the following reasons:—

1. If the severe effects, occasionally following cuts and punctures, received in dissection, were referable to the mere mechanical injury, how does it happen that they are noticed with such extraordinary frequency when the fingers or hands are wounded, and this sometimes in the slightest manner, in the examination of the bodies of persons who die of peritonitis, and especially of puerperal peritonitis? Why also should such effects be more common after pricks or cuts, met with in the opening of recent bodies, than of those which are more advanced in their decomposition? These circumstances are generally admitted to be facts, and, as they are mentioned as such by those who dispute the doctrine of poison, it is rather extraordinary that their direct tendency to prove the agency of a virus should have been overlooked by them in all their reasoning upon the subject. "Some dead animal substances," observes Dr. Macartney, "are more likely to communicate this dangerous disease than others. The brain in the recently dead state, is extremely apt to produce it, even when no wound is received. The sero-purulent fluid, found in the large cavities after death (if no means of prevention be employed) seldom fails to infect persons, and the most dangerous animal fluid is that contained in the cavity of the abdomen after puerperal peritonitis, or the serum found in parts which have suffered diffused or gangrenous inflammation. The white cancer of the liver, and the substance of medullary tumors, are found to be very irritating when merely applied to the hands, without a breach of surface." (*Op. cit*. p. 106.)

On the other hand, we sometimes see apparently the same consequences brought on in particular constitutions by cuts, punctures, or other slight mechanical injuries, which cannot possibly be complicated with the lodgment or operation of any poisonous matter. It is also a fact, that, notwithstanding the numerous pricks and scratches of the hand received in dissection, the production of any severe effects on the part and constitution is restricted to a very reduced proportion of such cases. It might also be urged, as an argument against the doctrine of poison, that the general indisposition is always in proportion to the extent of the local mischief; and the disease does not exhibit any determinate character, such as marks the effects arising from other poisons.

Dr. Macartney believes, that the spring season disposes persons to this species of inflammation; and that the state of the constitution gives a strong tendency to be affected by inoculation with dead animal matter. "When the general health is injured by intemperance, anxiety, or fatigue, even common wounds will be followed by consequences not very disimilar to those attending the introduction of dead animal fluids. From observing this fact, some persons have been induced to deny, that a poisonous quality exists in dead animal matter, and have ascribed the consequences of wounds received in dissecting to the nature of the wound itself, which is often punctured or lacerated. This opinion, Dr. Macartney argues, is perfectly disproved by the same irritation being communicated on an unbroken surface, and by the security derived from using the solution of alum, even when there is no wound."

The bad conseqences, occasionally following pricks or cuts received in dissection, begin with uneasiness and festering of the wounded part; considerable pain and irritation in the course of the absorbents; swelling and suppuration of the lymphatic glands at the inner side of the biceps or in the axilla; and more or less fever and constitutional disturbance. In some instances, the pulse becomes greatly accelerated, but weak, and a sense of unaccountable distress and anxiety is felt, and expressed in the countenance. Often there is extreme prostration of strength, with a furred tongue, and serious derangment of the functions of the stomach, bowels, and liver. In bad cases, the cellular tissue becomes immensely distended with serum, and this not only in the limb, but from the axilla over a large portion of the side of the chest, and even of the abdomen; the parts affected exhibiting the general appearance of phlegmonous erysipelas, or the skin being paler and colder, like what happens in diffuse inflammation of the cellular tissue. Sometimes, as Dr. Macartney has correctly described, inflammations arise, one after another, in parts remote from the original wound, and are unbounded by the effusion of fibrine. Pus is not always formed in these tumors, and, if opened on the supposition of their being abscesses, they are often found to contain only a bloody serum. Yet, in a large proportion of the cases which I have attended, purulent matter was formed and discharged. A very common place for such collections of fluid is under the great pectoral muscle, and, as Dr. Macartney remarks, out of the course of the absorbents leading from the hand to the subclavian vein. In some instances, vesicles or pocks arise in the neighborhood of the original injury. If the patient escape with his life, the health frequently continues in a shattered state, and anomalous complaints recur from time to time for several months*; and, as I have known, for two or three years afterwards.

Practitioners differ widely about the right treatment. One party, believing in the presence of virulent matter, advocate the plan of applying nitrate of silver, caustic potash, liquor ammoniæ, nitric acid, or liquid muriate of antimony, to the puncture or cut, as soon as it begins to be troublesome; and, instead of antiphlogistic treatment, recommend a generous diet, tonics, wine, and other cordials, the bowels being merely regulated with aperient medicines.

---

* See Macartney on Inflammation, p. 105.

Another party, doubting the existence and operation of any poison in the part, confide principally in antiphlogistic treatment, discharging the matter early, applying cold lotions, or poultices, to the part itself, with numerous leeches, and employing copious and repeated venesections, cold washes to the head, purgatives, and sometimes opium to tranquillise the excitement of the system. The advice, which has usually been offered by me to students, is, that the wound should be well sucked in the first instance, the nitrate of silver then applied to it, the hand covered with a cold evaporating lotion, and the limb kept quiet in a sling.

In the beginning, I believe, that antiphlogistic treatment should generally be preferred; but that when phlegmonous erysipelas, or diffuse inflammation of the cellular tissue, or abscesses, come on, the case should be treated according to rules explained in speaking of those disorders.

Dr. Macartney states, that, during the last fifteen years that he held the professorship of anatomy in the Dublin university, no severe disease occurred from wounds received in dissection, when the proper means of prevention had been employed. These consisted in immediately washing the wounded part, and afterwards keeping it wet for a few hours with a solution of alum in water.

Bite of a rabid animal. (*Rabies canina. Hydrophobia.*) The bite of a mad dog, or of certain other rabid animals, is the most dangerous kind of poisoned wound met with in this country, because it is apt to be followed by one of the most uncontrollable and rapidly fatal disorders to which human nature is liable.

All examples of hydrophobia admit of being divided into two classes:—first, those which cannot be ascribed to the bite of a rabid animal, or to the application of its saliva to a wound or an abraded surface; and, secondly, all cases which are produced either by the insertion of the salava into a wound, or its application to an abraded surface.

The first class of hydrophobic diseases is not strictly within my province. I mention, however, that it comprises *symptomatic* and *idiopathic* or *spontaneous*, cases; the first division being merely a nervous affection, accompanying certain inflammatory and febrile disorders, in which a considerable dread of water is occasionally manifested by the patient. As for the real existence of *spontaneous* or *idiopathic* hydrophobia, this is a subject of dispute, and I think there is ample room for doubting the correctness of the doctrine, since the histories of most of the persons, from whose cases the inference of the existence of such a disease is drawn, cannot be depended upon. They were, in short, generally drunken, irregular characters, and in the habit of lying about the streets in the night-time. Now persons of this description might have been bitten by rabid dogs, or some abraded part of the skin might have been licked by dogs laboring under rabies, though not known to be indisposed; and hence no recollection of the circumstance might have been retained. Dogs, in the early stages of rabies, are seldom prevented from going about as usual, and are even domesticated in families, and fondled by children and others, whose hands and faces they are permitted to lick. Now, should there be a slight pimple, or abrasion of the skin, this custom might lean to the communication of hydrophobia. But, leaving the question about spontaneous hydrophobia to be settled by physicians, I proceed to the consideration of the form of the disorder, which originates from the introduction of a specific poison into a wound, or its application to an abraded part of the skin, which poison is contained in the saliva of a rabid dog, cat, fox, or, as happens on the Continent, in that of a rabid wolf.

It is sometimes asserted, that hydrophobia always originates in animals of the dog kind, and in no other animals, and especially that it never originates in animals of the cat species, though communicable to them by the bite of a rabid dog. But this is an obscure point, about which as much dispute prevails as about the spontaneous origin of hydrophobia in the human subject. The indisposition may, however, be certainly transmitted from these animals, not only to the human subject, but to some other quadrupeds, and, as is alleged, even to birds, as, for instance, to the common fowl. Although animals of the dog and cat kind can communicate the disease to some other animals, it is not positively known, whether the herbiverous tribe can do so; though one case is related, in Ashburner's Essay on Hydrophobia, where a fowl became rabid after having been inoculated with the saliva of a rabid ox; but I do not know whether this statement has received any confirmation from other quarters. In Hufeland's journal, an instance of hydrophobia that was occasioned by the bite of a badger, is recorded. Attempts have been made to ascertain whether man can propagate the disease to other animals; but no instance of such transmission of it was ever completely made out, until, the year 1813, when Magendie and Breschet took some of the saliva of a man in the last stage of hydrophobia, and inoculated a dog with it, which became rabid on the eighteenth day after the inoculation, and bit two other dogs, one of which became rabid, and died in thirty days. This seems to be a strong fact in support of the opinion, that man may communicate the disease to other animals. There has never been an example of any human being in the hydrophobic state imparting the disorder to another human being, though some persons in this disease, now and then, become so unmanageable as to bite those who are near them. I remember an instance, in St. Bartholomew's Hospital, in which a medical man was bit by a patient who was laboring under hydrophobia, but no ill consequences ensued.

The wound, occasioned by the bite of a rabid animal, is not always followed by hydrophobia: this fact deserves particular attention, because attempts are frequently made to convince the world, that there are certain specifics and nostrums for the prevention of hydrophobia. Of the numberless persons who are bitten by dogs undoubtedly rabid, only a very limited number suffer from hydrophobia. Dr. John Hunter, who published an excellent paper on this subject, gives a list of twenty persons who were bitten by the same mad dog, yet only one of the whole twenty was afterwards attacked by the disease. According to Dr. Hamilton's computations, it appears, on an average, that not more than one out of every sixteen or seventeen persons, bitten by animals certainly rabid, becomes affected. Perhaps this calculation may be below the mark; and it undoubtedly is so, with regard to persons bitten by rabid wolves. On one occasion, in France, twenty-three persons were bitten by a rabid female wolf, and thirteen of them afterwards died of hydrophobia. In another instance, nine out of ten had a similar fate; and in a third example, in which twenty-four individuals were bitten by a wolf near Rochelle, eighteen died. It seems, then, that the bites of rabid wolves are extremely dangerous; a fact fully accounted for, as I conceive, by the circumstance of their teeth being larger, and penetrating more deeply, than those of the generality of dogs. The depth, extent, and situation of the bite are evidently circumstances which must materially influence the chance of the system becoming affected. Thus, bites on the hands or face, which are uncovered parts, are more dangerous than bites on other parts, which are covered by the clothes; because, in the latter examples, the envenomed saliva is likely to be wiped off the teeth, before they penetrate the body, and hence there must be less chance of its being inserted in the wound.

Dogs appear to be more susceptible of the disease than the human species: one rabid dog bit four persons and twelve dogs: none of the former were attacked with hydrophobia, although they underwent no particular treatment, and merely had recourse to common means, which daily experience proves to be unentitled to any confidence; but every one of the dogs became rabid. The term *hydrophobia* is scarcely applicable to the disease as it presents itself in dogs; for they can generally lap water without difficulty, and are sometimes very greedy of it, yet their doing so is generally fancied to amount to a satisfactory proof, that they are exempt from the disease. Now this is a serious mistake; for, as I have explained, they are for the most part fond of water, and lap it very eagerly. As for rabid wolves, when they are pursued, they will swim across wide and rapid rivers without the least hesitation or dread of water. Nor should it be imagined, that dogs are furious in the beginning of the disorder: at first they are merely somewhat irritable; afterwards they will bite other dogs, and even men, if they happen to be in their way; but they will not commonly turn out of their course to do so. Under the influence of the disease, in its early stage, the habits of a dog undergo a considerable change; thus he becomes fond of picking up small objects on the ground, and will even devour his own excrement; his voice is altered, the tone of his bark is quite different from what it is in the healthy state, being affected, indeed, as much as the voice of a cholera patient. The same circumstance is observed in other rabid animals, especially sheep. As for the opinion, that dogs are more subject to hydrophobia in warm weather than at other times, it is a completely erroneous supposition; and this is so far from being the case, that heat has no concern in it at all; for, in Jamaica, in some parts of which the heat is sometimes very great, not a single instance of a mad dog occurred during the long space of forty years. Now, as rabid dogs are occasionally met with in winter, other credulous persons suggested another hypothesis, which was, that dogs became rabid at this season of the year because they could not always get water enough, in consequence of the frozen state of the ponds; but one fact is sufficient to refute these idle speculations; in France, a list was kept of all the dogs which became rabid in a certain year; and it was found, that the smallest number occurred in January and August, one the coldest, the other the hottest, month in the year. I think, then, we can attach no value to any explanations of the cause of the origin of rabies in dogs, founded upon the influence of either heat or cold.

In the human race, the interval between the bite and the supervention of the disease is different in different examples. The majority of individuals are attacked at some period between the thirtieth and fortieth days; and the longer a person continues well after the latter period, the less chance is there of his ever suffering from the disease at all. From a list kept of a hundred and thirty-one cases, it appears that no person was affected before the eleventh day after the bite, and only three before the eighteenth. A few cases are reported by writers, where the interval between the period of the bite and the commencement of hydrophobia was as long as ten, twelve, twenty, and even thirty years; but these statements do not gain much belief, and few cautious reasoners will venture to give credit to any history, which represents the interval as having exceeded a year and a half. The wound, inflicted by the bite of a rabid animal, generally heals as readily as other common wounds do; and, indeed, it is usually healed long before the hydrophobic symptoms commence, which do not frequently come on in less than five or six weeks after the bite. The wound will, of course, be mostly well before that period. When, however, the constitutional symptoms do begin before the wound is healed, the bitten part, instead of presenting healthy granulations, and secreting good pus, has an inflamed and sloughy appearance, and the discharge, which is scanty, consists of an ill-conditioned thin sanious matter. At some indefinite period after the receipt of the bite, and occasionally long after it has healed, the patient feels a sharp pain in the part which was bitten; and such pain, if the wound should have been in the hand, extends particularly to the trapezius muscle, or to the side of the neck. In the meanwhile, the cicatrix, if the part should have healed, swells, inflames, and sometimes suppurates, and discharges an ichorous fluid; but, in other instances, the part may not inflame at all, and the indisposition may come on without the patient experiencing any inconvenience in the situation of the previous bite. In different constitutions, the other symptoms also vary: in the beginning of the indisposition, or the *first stage*, there is generally great depression of the spirits, and an indescribable anxiety; sometimes a chill or rigor is one of the earliest occurrences; frequently the sleep is disturbed by frightful dreams or spasmodic twitches; the pulse is more frequent and strong than in health, and the nervous system more susceptible of impressions. In fact, all the external senses become more acute; the eyes, the pupils of which are full and open, cannot endure the light; the person courts the shade, or even conceals himself in a dark place; the most trivial noises agitate him; and in this first stage, though the thirst is increased, the appetite is lost. In some patients, such is the augmentation of sensibility on the surface of their bodies, that we cannot even touch their hair, without producing a violent convulsive agitation of the system. This fact was exemplified in one case seen by Magendie. The durationof the first stage is sometimes very short, and the form of it such as not always to raise a suspicion of the commencement of this terrible and fatal complaint. Some patients are indisposed not more than a day or two, but others five or six days, previously to the *second stage*, which commences with a manifestation of a dread of liquids. The sight of water, or any attempt to drink fluids, now brings on violent convulsive agitation of the muscular system, and such a feeling of suffocation as those endued with the greatest fortitude cannot endure. These paroxysms of violent convulsive disturbance of the muscles, and the sense of suffocation, are certainly the most prominent effects of the attempt to swallow, or even look at, liquids; but they may also be excited in hydrophobic patients by other causes, such as the opening or shutting of a window or door, a current of air, a bright light, or the glare of a mirror. Some patients, though not able to swallow liquids, will swallow juicy fruits, if their outer surface be made quite dry ,before being offered to them. The influence of different sounds on hydrophobic patients is very curious: some of these unfortunate individuals can bear a great deal of noise without inconvenience; but, if the noise happen to be of a kind which is associated with the idea of fluids, then excessive agitation is produced, and paroxysms of the greatest suffering are brought on. Few hydrophobic patients can bear the noise of a pump, or the clatter of cups and saucers, or the sound of earthenware.

When patients, by an extraordinary effort, do get any fluid down into the stomach, it is soon ejected again, together with a copious quantity of mucus and a greenish fluid. Another very distressing symptom is the production of a thick ropy slime about the fauces and throat, which is so tenacious as to be compared by the patient to birdlime: his constant endeavors to free his mouth and throat from this oppressive secretion keep his jaws in continual motion, and, as soon as he gets rid of one portion of it, another is formed, so that he has no respite from his sufferings. In the latter stage of hydrophobia, the pulse is hurried the respiration laborious, the countenance ~~anxious,~~ and the features horribly contorted. Sometimes the patient is really furious and uncontrollable, though most frequently it is otherwise. He may be so unruly as to bite himself and others who are near him; but mostly he is quite rational and governable. A good deal of pain is generally felt in the epigastrium and chest; the patient is always constipated; but the urine is copious and high colored.

With regard to the usual period of death from hydrophohia, this is a point purticularly deserving of attention, because the period of the disorder, at which death occurs, is one criterion between hydrophobia and some other affections, which are occasionally confounded with it. The patient seldom lives longer than four or six days from the commencement of the hydrophobic stage, and then he is either carried off by a general and violent convulsion, or dies quietly in a state of complete exhaustion. The most common period of death is from two to three days from the time when the dread of fluids is first decidedly manifested. I have heard of a case that proved fatal in twenty-four hours: but the patient was a child.

Between hydrophobia and tetanus, the following considerations will serve as a criterion. Tetanus always begins with a spasm of the muscles of the jaw, which remains firmly fixed; in hydrophobia, on the contrary, the jaw is constantly in motion, from the incessant efforts of the patient to get rid of that ropy viscid secretion to which I have already referred.

In hydrophobia, the muscles are not constantly rigid; they are sometimes relaxed; but, in tetanus, they are incessantly hard and rigid; the spasms may be, and indeed are, periodically increased in violence; but the muscles affected are never entirely relaxed.

In tetanus, though there may be difficulty of deglutition, there is rarely a positive aversion to fluids, or a dread of them, and the patient will remain a long time in a bath without any inconvenience; this is not the case in hydrophobia,—the very idea of being put into a bath would excite such commotion in the patient, as might probably soon destroy him.

The paroxysms of tetanus are neither excited nor increased by light; neither are they affected by the noise or sight of water; but those of hydrophobia are violently increased by causes of this description.

Tetanus mostly comes on soon after the infliction of the wound, that is to say, within a few days; but hydrophobia does not usually begin until a more considerable time has elapsed from the period of the bite.

Then, tetanus will come on after any kind of wound,—even after a surgical operation; but, as true hydrophobia can only be produced by the application of the saliva of a rabid animal, to an abrasion or wound, it must have been preceded by the bite of such an animal, or by the application of its saliva to an abraded portion of the surface of the body.

In the examination of persons who have died of hydrophobia, inflammation may generally be traced in some part of the alimentary canal, in the mucous membrane of the pharynx, œsophagus, stomach, or intestimes; indeed, the mucous texture of these viscera may not only exhibit traces of inflammation, but of what almost amounts to gangrene. Marks of inflammation are also frequently discovered in the respiratory organs, the mucous membrane of the larynx, trachea, or bronchi. In some instances, there are appearances of inflammation about the medulla spinalis, increased vascularity, a thickened state of its membranes, and an enlarged tortuous state of the veins, running in the direction of the medulla itself. In the museum of University College is the stomach of a person who died of hydrophobia; it has been turned inside out and dried, and put into spirits; an increase of vascularity is very perceptible in it, and, about the lesser curvature, a cluster or chain of enlarged glands.

The poison of hydrophobia is generally believed to be contained in the saliva of a rabid animal; but, in consequence of the salivary glands not appearing to undergo any structural change, M. Trolliet, who wrote a good account of the disease a few years ago, brought forward the doctrine, that the secretion, with which the hydrophobic poison is really blended, is the mucus of the respiratory organs. He argued, that, as traces of inflammation existed in the lungs, and in the mucous membrane of the air passages, and nothing wrong could be detected about the salivary glands, his view must be correct. Trolliet's observations on this point, however, gained but few converts, and it was soon ascertained, that vestiges of inflammation about the mucous membrane of the respiratory organs in rabid animals was far from being a constant occurrence; for M. Magendie dissected several rabid sheep, in which no traces of inflammation in any part of the organs of respiration could be perceived. In dispelling the error, which I have now been considering, dissections have been useful; but, I am sorry to be obliged to confess, that, in other respects, they have not thrown any light either on the nature or the treatment of hydrophobia; in fact, though traces of inflammation are frequently noticed in the above-mentioned organs, they are observed only in a certain proportion of cases. In the bodies of persons destroyed by hydrophobia, there is no regularity in the appearance of inflammation in any particular situation or organs, so that, when it is met with, it seems rather as an incidental than an essential occurrence. Sometimes the lungs are emphysematous, vesicles being produced under the pleura pulmonalis, as is occasionally thought, by the rupture of some of the air-cells in the violent convulsive efforts of respiration in the course of the disease.

As hydrophobia is still regarded as an incurable disease, it must always be an object of the highest importance to prevent its attack, or the commencement of the symptoms. Fortunately, this may generally be accomplished, by removing the wounded parts as speedily as possible. When, therefore, we are called to a person, who has been bitten by a rabid animal, or by one suspected to be in this state, we should lose no time, and if the operation be practicable, have immediate recourse to the complete excision of the bitten parts. Sometimes considerable perplexity arises from the situation, or number of the bites; thus, we may meet with cases, where the parts into which the animal's teeth have entered, are very numerous; we may also be consulted for persons, in whom the teeth have penetrated among the small bones of the carpus, or tarsus, or close to a large artery. I remember an instance, in which the bite was situated close to the radial artery. In this circumstance, amputation has been proposed; but it might perhaps be a more justifiable plan to perform the complete excision of the bitten parts, together with the portion of the artery that happens to be in the way, and then secure the ends of he vessel. The excision of the bitten part is a proceeding which should be adopted early; for it is unquestionable the most likely means of preventing an attack of hydrophobia; but in order to answer this purpose, the incision must be carried deep enough. Now, it frequently happens, that there is an uncertainty about the possibility of cutting out every part reached by the animal's teeth, and on this account, before the operation is begun, I recommend a very simple, but obviously prudent measure to be adopted, namely, washing the wounded part well; we may let a stream of water fall upon it from some height, out of the spout of a tea-kettle, or throw warm water forcibly against the part with a syringe. Thus we may possibly wash away any virous lodged upon the surface of the wound, or near its orifice. I recommend the plan, which Sir David Barry advised, next to be pursued: the ablution is to be followed by the application of cupping glasses to the part; thus, we shall have a chance of removing another portion of the virus, and, at all events, we shall suspend the action of the absorbents in the part, which action, as Sir David Barry's interesting experiments prove, cannot go on when the atmospheric pressure is removed. Having done these things, we should perform excision in the most complete manner possible, and then apply the cupping-glass again. Lastly, by way of still greater security, we may cauterise the part. Such are the most effectual plans, which I can suggest, for preventing the absorption of the hydrophobic poison, and, no doubt, if performed in the order I have specified, they would rarely fail. In examples of the bites of snakes, we have not the same opportunity of preventing the influence of the poison on the system, because the effects of the poison take place with surprising rapidity, and, unless we were on the spot at the moment of the bite, the system would be affected before we could put the preventive means in practice; but, in the kind of poisoned wounds now under consideration, the virus is slower in its operation, and hence our plans for averting its action on the system altogether will have a better prospect of success. The interval between the bite and the constitutional disorder being long, and the admission of the virus tardy, the doctrine is often maintained, that if excision has not been performed at first, it is still called for so long as the constitutional derangement has not actually commenced, provided that not more than eight or ten weeks have elapsed from the period of the bite; for, after the sixth week, the chances of attack lessen from day to day. Of course, the sooner we excise the part, the better is the chance of preventing hydrophobia. Caustic alone should never be depended upon; for many instances of its failure are upon record.

For the prevention of hydrophobia, some other plans have been proposed. One medicine, formerly in great repute, was the *Ormskirk medicine*, but its reputation, at the present day, has declined. The same may be said of submersion in the sea. Some years ago, a Russian physician, Marochetti, extolled the practice of giving copious doses of the *genista tinctoria*, or butcher's broom, and of pricking with a lancet certain small pustules or vesicles, which, according to his statement, form under the tongue, between the third and ninth day after the bite. These vesicles, or pustules, it is alleged, form near the orifices of the ducts of the submaxillary glands. Many endeavors have been made to discover them; but, I believe, they have never been observed in this country. In France, M. Magistal is said to have noticed them in several instances, and to have tried Marochetti's plan, which failed in his hands, and is not at present a subject of much interest with us.

The importance of preventive treatment will be duly appreciated, when it is recollected that, after the commencement of the constitutional symptoms, the cure of hydrophobia is so rare, that the very circumstance of a recovery generally creates doubt about the possibility of the illness having been true hydrophobia.

In some other cases of poisoned wounds, especially those of the bites of certain venomous snakes, the patients will bear immense doses of the most powerful medicines, without danger of being poisoned. The liquor arsenicalis has been given, every half hour, in doses containing not less than one grain of arsenic, without any deleterious effects; the same fact is observed in hydrophobia and also in tetanus. M. Magendie dissolved ten grains of opium in water, and threw the solution into the venous system, without producing any narcotic effects, or derangement of the animal economy by the experiment; nay, the hydrocyanic acid itself is alleged to have been injected into the veins without the usual deleterious consequences. Such facts are adverse to the probability of any medicine being ever discovered capable of curing hydrophobia.

Magendie having observed in some experiments on animals, that the injection of water into the venous system seemed to have a tranquillising effect on the nerves, was induced to make trial of this plan in hydrophobia. In one patient he threw a considerable quantity of water into the veins during the paroxysms, so as to cause an artificial plethora, at first with some prospect of success, for the patient became tranquil, appeared for a time to be soothed, and actually lived nine days, which was a most uncommon event, as patients generally die in forty or fifty hours, and very few indeed live beyond the sixth day. The particulars of this case, therefore, were no sooner made public, than they raised expectations that a very important discovery had been made; but subsequent trials of the plan have not established its value, and it is now deemed of as little use as every other scheme for the cure of this disease.

Another plan, of which the most favorable report was received from the East Indies, was that of bleeding a patient *ad deliquium*. Instances of the success of this practice are given; but the trials, made of it in Europe, have not confirmed its efficacy. Indeed, I cannot mention any mode of treatment entitled to much attention, except for the purpose of stating that it has been tried unavailingly: thus, opium has been given in immense doses without any good effect; and so have the acetate of morphia and pure ammonia. Belladonna has been given by the mouth, and injected into the veins, without any useful result. Tobacco clysters have been employed in vain. In other examples, the parts have been washed with oxymuriatic acid, and the same medicine has been given internally, in the quantity of a drachm in the course of twenty-four hours, made into pills with crumb of bread. Galvanism has been tried, with the same result; and amongst the extraordinary schemes ventured upon, I may notice that of endeavoring to stop the action of the hydrophobic poison on the system by the influence of another powerful animal poison, such as that of the viper. On this principle, vipers have been purposely suffered to bite the patient; but the plan, which was tried in Italy, had no useful result. Arsenical preparations, and the Tanjore pill, which was once so famous in India as a means of preventing the fatal effects of the bites of snakes, the nitrate of mercury, turpentine, and thirty or forty other things which might be enumerated, have all been amply tried, and found to possess no real efficacy in hydrophobia.

OF PARTICULAR DERANGEMENTS OF THE MUSCULAR AND NERVOUS SYSTEMS FROM WOUNDS.

I have already treated of the ordinary general effects of wounds, such as inflammation, suppuration, abscesses, and fever; but besides these usual events, we observe, that wounds sometimes lead to such disorder of the animal economy, as manifestly to affect the nervous and musculur systems in an extraordinary manner and degree. Thus, in certain individuals, a very trivial local injury—one that involves no part of importance—will give rise to violent disturbance of the nervous system. Some persons always faint on receiving a mere scratch, or the prick of a needle, while others are seized with convulsions and vomitings from equally slight causes. In several instances, I have seen patients die before the completion of the operations which would not have been at all dangerous to the generality of persons, or those who had the advantage of better stamina. I have seen individuals die on the operating table, though they had not been at all debilitated, neither had they lost much blood during the operation. Now, if ruch idiosyncrasies were foreseen, it would be advisable, I think, for the surgeon to direct a dose of opium, or some cordial, to be given before the operation.

One of the most dangerous affections of the animal economy, occasionally produced by a wound, is *tetanus*, a disease that occurs with much less frequency in this country and other parts of the world having a temperate climate than in hot countries, where it is disposed to originate from slight injuries. Tetanus may be defined to be a spasmodic contraction, with rigidity of the voluntary muscles. In some examples, only the muscles of one or more regions are affected; in others, the disorder extends its influence to the voluntary muscles throughout the system. Their extraordinary contraction, rigidity, and tension may be said to be maintained without a complete relaxation at any time, in which respect tetanus differs from hydrophobia, as well as from ordinary spasms and convulsions. When the muscles behind the neck and down the back are thus stiffened and contracted, and the body drawn backwards, the disease is called *opisthotonos;* but when the action of the abdominal muscles preponderates, so as to bend it forwards, the disorder receives the name of *emprosthotonos*. According to Baron Larrey, who had many opportunities of seeing the disease when he was with the French army in Egypt, it appears that, in that country, when the wound was in the back, tetanus commonly assumed the form of *opisthotonos;* but if the wound happened to be in the anterior part of the trunk, and tetanus followed, it was generally in the shape of *emprosthotonos.* The reality of emprosthotonos has been doubted; but if we refer to Larre's Mémoires de Chirurgie Militaire, we shall find that, amongst the wounded of the French army in Egypt, this was actually the most common form of tetanus. Sir Gilbert Blane published two cases, which agree with the Baron's statement; for, in them, the side of the body, on which the local injury was situated, became the seat of the tetanic affection; another variety, termed *pleurosthotonos.*

Tetanus is called *complete* when the muscles of the body at large are affected; that is, when the greater number of the voluntary muscles are spasmodically and rigidly contracted. When this is the case, the muscles antagonise and counteract one another, and the body is not drawn more in one direction than another. When the disease is confined to the muscles of deglutition, and to those of the lower jaw, it receives the name of *trismus* or *locked-jaw.*

Now, although the muscles in tetanus are in a state of incessant contraction, without *complete* relaxation, there are certainly periodical diminutions of their rigidity. In fact, inasmuch as the spasmodic action of these organs usually has paroxysms of increased violence, there must be periods or intervals during which they are less severely affected; yet they always continue rigid and hard—there is no complete relaxation of them; and the jaws being permanently closed, there is often the greatest difficulty in administering medicines, or getting food into the stomach.

Tetanus is divided into the *traumatic* kind, or that which arises from wounds; and into the *idiopathic*, or that species of tetanus which originates from other causes. Another important division of tetanus is into *acute* and *chronic.*

The *acute* is exceedingly dangerous, and often fatal; but the chronic may frequently be cured, and, at all events, it is curable in a much greater proportion of cases, than the acute. Traumatic tetanus often comes on and advances to its termination in a surprisingly rapid manner. Thus, a case is recorded of a negro in the West Indies who died of tetanus in a quarter of an hour, from a slight scratch of the thumb; but, in general, its course is more gradual. It was found by the surgeons of the British army in Spain, who saw a great deal of tetanus, that if the disease did not commence on or before the twenty-second day from the receipt of the wound, there was little chance of its coming on at a later period. This is an important circumstance to be remembered. In Egypt, Baron Larry found, that the latest period of attack was the fifteenth day fiom that on which the wound happened. Traumatic tetanus frequently proves fatal on the second, third, and fourth day from its commencement, but sometimes even as late as the seventeenth. I had a soldier under my care in one of the military hospitals in Holland, who lived five weeks after the supervention of tetanic symptoms: this was a case of chronic tetanus, following a gunshot wound and amputation of the thigh, at Bergen-op-Zoom; and certainly it was a horrible specimen of the effects of tetanus, for the muscles were drawn entirely away from the bone, which was left protruding far beyond the flesh, while enormous abscesses formed in the hollow of the stump, and made their way so extensively as absolutely to encompass nearly the whole of the pelvis.

With regard to the symptoms of tetanus, the first thing usually noticed is a sensation of stiffness in the neck, gradually increasing, and at length causing pain when the head is moved. The first symptom is followed by an uneasy feeling at the root of the tongue, with a difficulty of mastication and swallowing. When the disease has made further progress, the attempt at deglutition is attended with violent convulsive efforts; in particular, when the patient attempts to swallow liquids, he experiences much inconvenience, and in consequence of the pain and severe paroxysms of spasms which then attack him, he will sometimes manifest a strong aversion to fluids, and thus his disease may bear a resemblance to hydrophobia. It was on this account, that I particularly adverted to the characteristic differences between the two diseases. The next symptom which the patient complains of is pain about the ensiform cartilage or a violent shooting pain, directed from that part towards the spine in the course of the diaphragm. This additional grievance brings on an increase in the violence of the spasms; and, in particular, the muscles of the lower jaw now contract with greater power, so that the jaws remain inseparably applied to each other. As the disease continues, there is a marked increase in the spasmodic contractions of the diaphragm, which come on every ten or fifteen minutes, and are succeeded by extraordinary degrees of spasm and rigidity of the muscles of the back, and also of those of the lower extremities. At length, the abdominal muscles begin to be affected, and the belly feels as hard as a table: so violent is their action, that the recti abdominis have been known to be lacerated. The spasms next extend to the muscles of the lower extremities, and even to those of the arms; but the muscles of the fingers usually remain undisturbed to the last. Nor are those of the tongue affected till a very late stage of the disorder; and when this happens, the patient cannot control the motions of that organ, so that it is frequently thrust between the teeth and terribly lacerated. These muscular contractions are attended with the most excruciating pain during their attacks; the pulse is contracted, hurried, and irregular; the respiration quick and oppressed; but, during the remissions, neither the pulse, nor the breathing, may be seriously disturbed. In the generality of cases, the heat of the body is not increased; the urine is voided in small quantities, and sometimes with difficulty; and there is invariably obstinate constipation. As for cerebral disturbance, the patient remains free from it till the last stage; and, when the patient dies, it is generally in a paroxysm of violent convulsions. The blood has been asserted not to exhibit in tetanus the inflammatory crust, and the crassamentum is stated to be loose; but these are points which are variously represented by different writers.*

Baron Larrey had to treat a case of tetanus, produced by so trivial a cause as the irritation of a small fish-bone lodged in the throat of a French soldier in Egypt. In cold countries tetanus is much less frequent; and when we see it in this country, it is generally as a consequence of wounds, either peculiar in their situation or in their nature, namely, they are usually lacerated, contused, or punctured wounds in tendinous parts; wounds of the thumb, toes, or fingers, or deep-punctured wounds in the sole of the foot, compound fractures, or compound dislocations of ginglymoid joints, and especially of the thumb. These are the most common exciting causes of traumatic tetanus, when it occurs in this country. But, although contused and lacerated wounds of tendinous parts are those most likely to bring it on, any description of local injuries may excite the disease; thus, we sometimes see it caused by simple wounds in common parts; sometimes by wounds in a healthy healing state; sometimes by sloughing wounds, and the most complicated forms of local injury. I have known it follow amputation, castration, and the removal of a diseased breast. It has been known to originate from a burn.

Dissection has thrown no light on the nature and treatment of this formidable complaint. Sometimes the morbid appearances bear a close resemblance to those observed in the examination of the bodies of persons who have died of hydrophobia. We may meet with traces of inflammation in the pharynx and œsophagus, and in the mucous membrane of the intestinal canal. In one instance, Baron Larrey noticed a layer of coagulating lymph on the lining of the pharynx and œsophagus, which organs were contracted in an extraordinary degree. In another case, he found scales of osseous matter deposited on the arachnoid covering of the medulla spinalis; but it is hardly possible that these formations could have been concerned in the production of the disease, because they must have required more time for their completion, than the sudden origin and rapid course of the disease would have admitted. In some examples, the coverings of the medulla spinalis are found inflamed; and, in others, the substance of the medulla spinalis itself is changed. Thus in one case, examined by Dupuytren, the coverings of the medulla spinalis exhibited marks of inflammation; and in another, examined by Brera, the texture of the medulla itself was altered.

---

* "In tetanus, and where death ensues from great muscular efforts, all the blood is found nearly as liquid as water."—Macartney on Inflammation, p. 124.

None of these morbid appearances, however, are sufficiently constant to justify the opinion of their being essentially connected either with the origin, or the symptoms of tetanus. When the arachnoid tunic of the medulla spinalis is inflamed, it is said that the symptoms produced are those of opisthotonos, or that form of tetanus which consists in so forcible an extension of the spine, that it is bent considerably backwards.

With respect to the *proximate cause of tetanus*, this is a subject involved in considerable obscurity. Why should a wound in one individual produce tetanus, while a similar wound in the same part in another individual may be followed by no serious consequences whatsoever? From the frequency of tetanus in warm climates, it is natural to suppose, that the state of the constitution is concerned in the production of the disease; namely, that it acts as a predisposing cause: and of this fact, I think, there can hardly be a doubt. Yet we must not altogether exclude local circumstances from consideration, for they seem to have their share in the production of tetanus. If this were not the fact, we should not observe that certain descriptions of wounds, and wounds in particular situations, more frequently give rise to tetanus than ordinary wounds. We must, therefore, presume, that there is something in the state of the wounded parts themselves conducive to tetanus. If it were not so, we should not find, that lacerated and contused wounds and injuries of tendinous parts, so frequently produce it. Then, another question arises, whether the partial division of nerves is the exciting cause of tetanus? Baron Larrey relates some cases in support of this doctrine; but whether the opinion be true or not, the fact is, that tetanic patients cannot always be cured by making a complete division of the nerve. Mr. Liston relates an instance, in which the branch of the median nerve distributed to the thumb was partially divided, and in which amputation was performed, in the hope of curing the tetanic symptoms, but without success. When the limb was examined, the extremity of the nerve was found inflamed and thickened. Dupuytren records another case, in which tetanus arose from the knot of the lash of a whip being detached from it, and forced into the ulnar nerve.

It was noticed by Baron Larray, that when tetanus comes on, the secretion of pus from the surface of the wound ceases, or its quality is considerably altered; and hence he was led to suspect, that the origin of the disease might be, in some degree, owing to the stoppage or disturbance of the process of suppuration. This induced him to try what would be the effect of endeavoring to renew the secretion of pus. But this stoppage of suppuration appears to me to be rather the effect of tetanus than the cause of it: indeed, I mentioned, when on the subject of suppuration, that all great disturbances of the constitution had immense influence on the process of suppuration, as well as on the secretions in general; and it is not at all surprising therefore, that in traumatic tetanus we should find suppuration stopped or the pus converted into a scanty, dark-colored unhealthy secretion.

With regard to the *prognosis in acute traumatic tetanus*, I may remark, that the disease generally proves fatal. Dr. Parry thought, that one criterion, respecting the probable issue of the case, might be derived from a calculation of the velocity of the circulation; and it was his belief, that when the pulse was not more than 100 or 110 before the fifth day, a favorable termination might be hoped for. Then, it is remarked by men of great experience, that if the patient live beyond the ninth day, he will have a much better chance of recovery than he had previously.

Idiopathic tetanus is well known to be less dangerous than the symptomatic or traumatic form of disease: many cases of the former end favorably, but the traumatic species of tetanus—that which surgeons have to deal with—is generally fatal. It is, indeed, a form of disease, over which the resources of medicine and surgery have much less control.

The *treatment of traumatic tetanus* comprises both local and constitutional measures. Local treatment seems naturally to suggest itself, because, the disease being brought on by a wound, we must suspect that some irritation is existing in the part, or some peculiar operation is going on in it, which is concerned not only in producing the disease, but in maintaining and aggravating its symptoms. The suspicion of the disease being dependent upon the partial division of a nerve, led to the practice of endeavoring to detach the wounded part from all nervous communication with the sensorium. This was attempted in two ways—first by amputation of the wounded limb. Thus Baron Larrey proposes the following question: whether in traumatic tetanus it would not be wiser to amputate, without delay, than to make trial of other means, which experience proves to be almost constantly unavailing? The same surgeon even published cases in support of the practice of amputation; but, on looking attentively over them, it seems that all those in which amputation proved successful, were instances of *chronic* tetanus; and we now know, that the chronic variety of this disorder may frequently be cured without amputation, and that it is generally more under the control of medical and surgical treatment than the acute form of the complaint. Indeed, Larrey himself admits, that amputation is of no use in acute tetanus, nor when the disease has made considerable progress. I believe he only means amputation to be practised in the beginning of those cases, which are likely to be slow in their progress, and for these I should say it is unnecessary. Military surgeons generally disapprove of amputation, as a means of stopping tetanus. In the hospitals of the British Legion in Spain, the practice is also stated to have been fruitless.* Sir

---

* See "Alcock's Med. Hist. of the Legion." 8vo. Lond. 1838.

Astley Cooper, Mr. Abernethy, and other distinguished surgeons, also join in this opinion. I have already alluded to the case recorded by Mr. Liston, in which he amputated the arm, in the hope of arresting the tetanic symptoms, where there was a partial division, and an inflammation, of the branch of the median nerve distributed to the thumb. The amputation seemed to stop the spasms for a moment, but they soon returned with greater violence. In this instance one curious circumstance was exemplified, namely, as soon as the operation was finished, Mr. Liston wished to let the arteries bleed a little while before they were secured, but he found that they had contracted so much, that scarcely any blood could be obtained. In fact, no ligatures were necessary, for there was no hemorrhage.

Another less severe local treatment has been proposed, one which acts, however, on the same principle as amputation; it is that of making a deep incision in the wound, so as completely to divide the partially injured nerve. This practice has occasionally answered; and I remember one instance of tetatnus, produced by an injury of the supra-orbitary nerve, where a complete division of this nerve, performed by cutting down to the bone, had the effect of stopping the disease. In the Medical Gazette, No. 271, the particulars of a case are recorded, in which Dr. Murray, of the East India Company's service, succeeded in arresting an attack of tetanus by dividing the posterior tibial nerve behind the inner malleolus, the disorder having been rapidly induced by the entrance of a rusty nail into the sole of the foot. The relief was certainly very remarkable. On the same principle, moxa, cautery, and caustic have been used to destroy the seat of irritation, and cut off the nervous communication of the part with the sensorium. In Baron Larrey's history of military surgery, there are instances where the medium nerve had been included in the ligature on the brachial artery, and also cases, in which a ligature on the femoral artery had embraced the branches of the crural nerve; here it was suspected that the tetanus, which ensued, might have originated from the unskilful inclusion of the nerves, and the proposal was made to cut down to the artery, and remove the ligature. In one case, Larrey actually tried this plan; he exposed the femoral artery, and took away the ligature; but the tetanus was only stopped for a short time by this proceeding, and then it returned with increased violence. Finding this expedient unavailing, he then cauterised the whole surface of the stump, and administered opium. The patient ultimately recovered; but it cannot be affirmed, that the cure was absolutely promoted by the removal of the ligature. No doubt the practice was rational; yet nerves are so frequently tied without tetanus being brought on by it, that it is difficult to say what influence the tying the nerve truly had in the instance before us.

In consequence of the stoppage of suppuration in the wound at the commencement of the tetanic symptoms, some surgeons endeavor to renew the discharge by means of blisters; but as the suppression of suppuration seems to be rather an effect, than a cause of the disease, it does not appear that much good is likely to be derived from this suggestion; indeed, I can trace but little evidence in favor of such treatment.

Another practice is that of stimulating the wound with tobacco poultices, turpentine, laudanum, and other applications. This practice was tried upon an extensive scale in our army in Spain, and in the French army in Egypt; but the reports of it are not such as to justify the hope of its proving useful. It is discouraging indeed to learn from Sir James M'Grigor, that in several hundred cases, which happened amongst our troops in Spain and Portugal, very few were benefited by any medicine or plan whatsoever, after the disease had made any progress, and attained the acute form.

In consequence of the blood being sometimes buffy, and the pulse being full and quick in the beginning, we might suppose, that bloodletting would be beneficial, especially in strong robust persons; but notwithstanding such foundation for the practice, experience has produced few facts in evidence of its usefulness. It is a treatment that has been extensively tried, but without any decided good, so far as I am able to judge; and some surgeons of vast experience positively declare, that death is accelerated by it. I hardly dare venture, therefore, to recommend venesection, especially as it has failed in every case, where I have seen it tried myself. In Mr. Alcock's work is an absttact of seventeen cases of traumatic tetanus, which occurred in the British legion in Spain. The first six were treated by bleeding, opiates, and calomel, and all of them proved fatal. Of the remaining eleven, one for which carbonate of iron was administered recovered; while of the other ten, in which bleeding, acetate of morphia, calomel, and opium, and tartarised antimony, were employed, only one got over the danger of tetanus, and this patient afterwards fell a victim to irritative fever arising from injury of the knee-joint. With regard to the question of taking away blood in tetanus, I would abstain from venesection; but if the patient were strong and athletic, with a full quick pulse, I should not be afraid of having recourse to local bleeding, of applying cupping-glasses near the spine, or leeches to the throat and neck, as it is in those regions that inflammation, when it does prevail, is mostly observed. The application of antimony ointment, or of a long strap of blistering plaster, or even of the actual cautery, to the integuments over the spine, has been occasionally tried, and, as is reported, with some degree of success.

Obstinate costiveness being invariably attendant on the disease, one indication is to restore the functions of the intestines, and to procure avacuations from them, which is sometimes difficult;

for tetanic patients are not easily affected by purgatives. Mr. Abernethy used to prefer for this purpose calomel and jalap, mixed with treacle; but we have now a more convenient and certain medicine, namely *croton oil*. It is more sure in its effects than any other purgative that can be administered; we may give one or two drops of it mixed with mucilage or gruel. By this dose a copious evacuation will generally be produced; a considerable advantage, because we are commonly exhibiting at the same time another medicine, which has a contrary effect, namely, opium. Now if we can keep the patient under the influence of opium, and also succeed in maintaining the regular and proper action of his bowels, we are doing almost as much for him, I believe, as it is in the power of medicine to accomplish. The painful nature of the muscular contractions led to the trial of narcotic medicines almost as a thing of course; and, accordingly, opium has been fairly and repeatedly tried. Other narcotics have also not been forgotten; in particular, hyosciamus has been frequently given, and found to relieve the patient's sufferings, though inadequate to effect a cure. Patients in tetanus are not so easily acted upon by medicines as in the generality of other diseases; in fact, they seem to require immense doses of medicine, and especially of opium. It is not uncommon to give from half a drachm to one drachm of opium every six hours, and from half a drachm to one drachm of the extract of hyoscyamus. In tetanus we may certainly give medicines in large doses; but I would not recommend the immense quantities here specified as a prudent plan to begin with. The safest maxim is to commence with small doses and gradually increase them. In some cases, the stomach does not appear to digest the medicines put into it: thus, in one instance, Mr. Abernethy opened a person who died of tetanus, and thirty drachms of opium were found in the stomach.

Opium is sometimes administered in clysters; and it is not unusual, in trismus, to have recourse to frictions with opiate liniments about the neck and jaws. For this purpose laudanum alone, or equal parts of laudanum and soap liniment, are employed. Perhaps purgatives, with opium, or the muriate, acetate, or sulphate of morphia, are the most valuble medicines in tetanus. The warm bath has been occasionally tried, but no confidence is now placed in it; indeed, in the West Indies some individuals died almost as soon as they were removed from it; and as for the cold bath, it has proved in traumatic tetanus decidedly injurious. Amongst other things, mercurial frictions have been extensively tried: I have seen them used in five or six cases, but invariably with ill success. What confidence can be placed in them, when we hear, on the authority of Sir James M'Grigor, that a soldier, in Spain, who happened to be using mercurial ointment for the itch, was positively attacked with tetanus while under the influence of mercury.

Dr. Elliotson conceived that there was some resemblance between tetanus and paralysis agitans and chorea, in which the sesqui-oxide of iron has been given with great success: he was therefore led to try the same medicine in three cases of traumatic tetanus, two of which were cured by it. He gave from two drachms to half an ounce every two hours, obviating costiveness with castor oil and turpentine. The particulars of several other successful cases have likewise been communicated to him. I prescribed the sesqui-oxide of iron in one case of traumatic tetanus, but without success. The disorder had advanced too far, I believe, when the medicine was begun.

FRACTURES.

A *simple* fracture is so called, when there is no external wound communicating with, or extending down to, the broken part of the bone. A person may have a broken bone and a wound at the same time on the limb; still the fracture may be a *simple* one; because it is essential, that the wound should communicate with the injury of the bone, to constitute what is denominated a *compound fracture.* If I were to fall down and break my thigh, and at the same time receive a cut, or laceration of the soft parts of the thigh, quite unconnected with the fracture, the case would not be of the sort, which, in surgical language, is distinguished by the term *compound.* I may also observe, that the kind of wound, which is essentially requisite to render a fracture compound, is generally produced by the protrusion of the broken bone itself: I say *generally*, because, in compound fractures, the result of gunshot violence, the wound is always occasioned by the ball, or bullet, that enters the limb. When the bone is broken in several or many pieces, the fracture is said to be *comminuted*, while *complicated* is the epithet applied to fractures combined with a variety of circumstances, adding to the difficulty of the treatment, or requiring especial attention. Thus, the combination of a fracture with the wound of an artery, a dislocation, (for there may be dislocation and fracture of the same bone together,) injury of viscera, or of any organs, whose functions are highly important, will make the case a *complicated* fracture. Thus the rami of the ischium and os pubis may both be broken, and the fragments of bone may be so displaced as to lacerate the urethra, and give rise to an extravasation of urine. In a fracture of the ribs, the lungs may be wounded, in which case the additional complication of emphysema may be produced. Hemorrhage is more frequently a complication of compound fractures of the legs than of any other fractures, except such as implicate the anterior and lower angle of the parietal bone, in which accidents the spinous artery of the dura mater is usually ruptured, though the hemorrhage is then not external, but takes place on the dura mater. I may state also, that whenever there is extensive laceration of the soft parts, or whenever the fracture runs far along the shaft of the bone into one of the large joints, as for example into the knee, the accident ranks as a *complicated* fracture.

But, besides these distinctions, there are others derived from the direction of the fracture, as when it is ***transverse***, ***oblique***, or ***longitudinal***, particularities worth remembering, because they have considerable influence over the difficulty of the facility effecting a cure. Thus, if the thigh-bone be broken, and the fracture be oblique, the lower portion of the shaft of the bone will be much more easily displaced, and more difficult to keep reduced, than if the fracture were transverse. The reason of this fact is sufficiently obvious, for, in consequence of the obliquity of the surfaces of the fracture, the two ends of it are enabled to glide over each other, and the muscles arising from the pelvis, and inserted into the femur, patella, and bones of the leg, draw the lower fragment towards their origin, or more fixed point. But when the fracture is transverse, the resistance of the upper end of it will tend to maintain the lower in its proper situation, at least, so far as the preceding kind of displacement is concerned. Next to the circumstance of a fracture being *simple*, *compound*, or *complicated*, that of its *direction* is most important to be remembered.

The long cylindrical bones, which serve as pillars or arches of support for the body, or as levers for the action of the muscles, are, by the nature of their office, particularly exposed to fractures. Their shape, use, and situation, are all so many circumstances rendering them extremely subject to be broken. On the other hand, the broad flat bones, such as the scalpa, ternum, and os ilium, though sometimes fractured, are much less frequently so injured than the long cylindrical bones. The bones of the skull, however, which are broad and flat, are exceptions to this observation; but this is owing partly to their superficial situation, or their not being covered by any great quantity of soft parts, and partly to the force with which the head is generally struck by falls and blows. In short, the head is a part remarkably exposed to external violence; and I may say, as a general rule, that the more superficial a bone is, and the more exposed it is to the action of external violence, the more liable it is to be broken.

It has been sometimes asserted, that the action of the muscles is invariably concerned in the production of fractures; but this doctrine goes beyond the bounds of accuracy. We know that the patella is often broken by the violent action of the muscles in front of the thigh; that the olecranon and part of the os calcis are sometimes torn off from a similar cause; and also that the humerus is occasionally broken by the force of muscles attached to it. I once attended a man, who broke his arm by aiming a blow at another person, whom he did not succeed in striking; neither did he fall; yet the humerus was broken. It is true, that when a person falls down, he endeavors to save himself, and for this purpose puts his muscles into violent action, which may therefore be supposed to have some share in producing certain fractures; yet that muscular action is *always* concerned in producing fractures must be an incorrect hypothesis. When the cranium is fractured, can we possibly suspect the action of the muscles, or, at any rate, of any muscles belonging to the patient himself?

Fractures then are produced, first by external violence, operating directly on the part broken; secondly, by external violence applied to parts more or less remote from the seat of fracture; and thirdly, by the action of muscles, as in ordinary fractures of the patella. When a person alights on the ground from a great height, and fractures his thigh or leg, the resistance of the ground and the weight of the trunk produce the fracture; there is no violence applied directly to the broken part, but the extremities of the bone receive the force, and the middle portion of the bone bends and breaks. This case is very different from one, in which a man's leg is broken by the kick of a horse; here the violence is applied directly to the part which is fractured.

Fractures are more common at some ages than others. Particular bones, too, are broken with remarkable frequency in young persons, while certain other bones are more usually the subject of accident in aged individuals. In children, the femur, the humerus, and the clavicle are often broken; in adults, the bones of the leg and forearm, the femur, humerus, clavicle, and ribs; and in old persons, the neck of the thigh bone suffers in numerous instances. The functions of some of the bones render them very liable to fracture; thus, the radius, which supports the hand, and receives all the impulses communicated to this busy part of the limb, is far more commonly broken than the ulna. The clavicle, which keeps the shoulder in its right position, and supports, in the manner of a pivot, all the motions of the upper extremity, is particularly liable to be broken. I have said, that fractures may occur at all ages; but, as the texture of the bones varies at different periods of our existence, some differences in their liability to fracture will be created by this circumstance. The quantity of earthy matter in the bones of children is comparatively small; but as man advances in years, the proportion of this ingredient increases, while that of the animal matter diminishes; the consequence is, that they are rendered considerably more brittle than in the early period or life. In children, the large proportion of animal matter in the bones communicates to them a degree of elasticity and flexibility, far exceeding what is noticed in the bones of older subjects. In children the bones are also much protected by the quantities of adipose substance, and the muscles are not yet sufficiently developed to act violently upon them. The bones of children ought, therefore, to be rarely broken; but their venturesome tricks and carelessness in some measure counterbalance the advantages which I have been noticing, and explain the reason why the fractures of particular bones are tolerably frequent in the early periods of life. The bones of children, in bending, sometimes break only in the convexity of the curve; a peculiarity restricted to the early periods of life. In adults, in whom the texture of the bones is actually strongest, one might expect a corresponding diminution of the frequency of these accidents; but the protection of firmness of texture is counterbalanced by the many dangerous employments in which a large class of society is engaged, in the long interval between childhood and old age. In full manhood, too, the mascular system has acquired its greatest force, and hence fractures of the bones of adults are very common indeed. A predisposition to fractures is known to be brought on by certain diseases, as, for instance, syphilis in its worst and most aggravated forms: a thighbone, in the museum of University College, belonged to a person who had been taking mercury a little while before his death, for venereal complaints,—in fact, there is a node on the bone; now, the femur of the opposite side, contained also in the same museum, broke spontaneously, that is to say, from the slight action of the muscles while the patient was turned in bed. This is an instance of predisposition to fracture, arising from the influence of impaired health in certain conditions of the venereal disease. In the advanced stages of cancer, the bones are also frequently broken by the slightest force or pressure, or the common and even very weak action of the muscles. Rickets, fragilitas, and mollities ossium, scurvy, scrofula, fungus hæmatoides, and certain diseases within the cancellated texture of the bones, are all well known to communicate a predisposition to fractures. I may also remark, that when a tumor presses upon a bone in such a manner as to cause the absorption of the osseous texture, of course, a predisposition to fracture will be produced. At University College are the remains of a thigh-bone, which is absolutely reduced to a mere shell by the pressure of a tumor in the region of the ham, and from the weakened appearance of it, it is manifest that the slightest force would have been sufficient to occasion a fracture of it. At the same institution is also the humerus of a boy, that was broken by shampooing, tried for the relief of some scrofulous affection; in fact, the bone was broken twice: the first fracture united, but the second did not do so. In this case, no doubt the texture of the bone had been weakened by scrofulous disease. In the same collection is a preparation illustrating the alteration, which any cancerous disease in the body may produce in the bones: it is part of the skull of a woman, who had cancer of the breast; some of the texture of the bone is absorbed, and an animal matter which is sometimes described as a scirrhous substance, is deposited in its place.

If a similar change were to occur in one of the long cylindrical bones, it would become so weakened as to be broken with a very slight force. In the museum of St. Thomas's Hospital, there are or used to be two thigh-bones, which were broken in consequence of their texture being weakened by the effect of cancer; in the sternum of one of the patients, from whom they were taken, is a proportion of scirrhous matter, occupying the place of the earthy matter which has been absorbed. All pathologists know, that this effect of cancerous diseases in the body on various parts of the skeleton is not an uncommon occurrence.

With respect to the *general symptoms of fractures*, some of them are rather *equivocal*, because they may attend other cases. Of this description are pain, inability to use the limb, and more or less swelling: all these symptoms may be noticed in other cases, as in contusions, in the generality of dislocations, and in rheumatism; they afford, therefore, no positive information about the nature of the case. The symptoms, on which great dependence may be placed, are, first, the separation, which often takes place between the two ends of the broken bone; secondly, the inequality or projection of the broken part of the bone, which, when it is not covered with a great thickness of soft parts, is frequently obvious; thirdly, a change in the natural shape of the limb. Thus, an angular deformity may be produced, the limb seeming to be bent, and the axis of one fragment not corresponding to that of the other; or there may be a shortening and rotation of the limb inwards or outwards, from which position it may be more easily moved than in the case of a dislocation; the limb in the latter kind of accident being always more fixed.

But of all the symptoms and signs of a fracture, none is of greater importance, or affords a better proof of the nature of the injury, than the *crepitus* or grating noise or sensation, occasioned when one end of the broken bone is moved upon the other. It is true, that, in some cases, where the quality of the synovia is altered by disease, a grating may be felt when a joint is moved; but, generally, there is no risk of such a case being mistaken for a fracture. Yet it should be known, that the absence of crepitus is no proof, that a fracture may not exist; for, when a fracture has continued some days, the ends of the bone become smooth, and there will consequently be no crepitus or grating. The two ends of a broken bone may also be so much displaced as not to be in contact, and then, of course, no crepitus can happen. On other occasions, a portion of the soft parts may be interposed between the fragments, as, for instance, a portion of muscle: and here, likewise, no crepitus will be felt on moving the part; but whenever the grating noise or sensation can be distinguished, it is one of the surest signs of the existence of a fracture. The grating may usually be perceived on pressing upon or trying to bend the bone itself, or on bending, extending, or rotating the nearest joint. One symptom of a fracture is the loss of the use of the limb or part: this is, no doubt, a common effect of most fractures, the functions of the limb or part being more or less impeded; but no positive conclusion can be drawn from this circumstance, because it is one that accompanies other injuries and diseases, and does not invariably attend a fracture. When the portion of the limb, in which the fracture takes place, has only one bone on which its inflexibility and firmness depend, then the loss of its use will immediately result from its being broken. Thus, when the humerus or femur is broken, the patient immediately loses the power of using the limb; but if only one bone happens to be broken in a part of a limb in which there are two bones, the patient may then retain some use of the member. For instance, if the ulna alone be broken, considerable power of using the hand and forearm will remain; but, if both the radius and ulna be broken, then the circumstances will be different, and the functions of the part will be more or less completely interrupted. Sometimes even when there is only one bone in a limb, and that is broken, a degree of power of employing the limb will be retained, that is to say, the use of it will not be so entirely destroyed as to render the nature of the case at once manifest. Thus, in a fracture of the neck of the thigh-bone, if one fragment be wedged and entangled in the other, there will be no separation of them, nor any retraction of the limb; and patients in this condition have actually been able to walk some distance after the accident. This circumstance might cause the real nature of the injury to remain unsuspected; but it is very rare. When the injured part of a limb contains two bones, and only one of them is broken, the other supports the fractured one, and generally prevents retraction, or much displacement; in fact, the perfect bone acts as a splint in keeping the broken bone steady, and hindering deformity; and, under these circumstances, great attention may be requisite to detect the nature of the accident.

With regard to *swelling*, which is one of the symptoms of a fracture, it may be produced either by extravasated blood, by increased fulness of particular muscles in consequence of the shortening of the limb, and the approximation of their origins and insertions to one another, or by the prominence or projection of the broken bone itself. By any or all of these causes, there may be an *immediate* swelling produced. The muscular swelling is exemplified in fractures of the thigh-bone, in which the middle portions of the triceps, the rectus, and the other extensors of the leg give a preternatural convexity and fulness to the forepart of the thigh. A similar effect may be observed in the arm, when the humerus is fractured above its middle: then it is the coraco-brachialis and biceps which chiefly produced the muscular prominence. Besides the immediate swelling, to which so many causes may contribute, a still greater degree of tumefaction follows at a later period, and is the result of inflammation. This kind of swelling of course requires some time for its production; and hence, when a bone has been some hours unset, the swelling, from all the various circumstances which I have mentioned, may be considerable, and such as may render the true condition of the bone obscure. When, therefore, a limb is suspected to be broken, it should always be carefully examined in the first instance, because then the examination may be made with less pain to the patient, and the nature of the injury can be made out with less difficulty than at a later period, when the inflammation and swelling have attained a considerable degree.

The *displacement* attending fractures is a subject, to which too much attention cannot be paid. Surgeons should certainly have precise ideas about the particular kinds of displacement to which the various kinds of fractures are liable; because the displacement is necessarily accompanied by deformity, or deviation of the part from its natural shape; and the grand object in the treatment is unquestionably the prevention of such deformity by every possible means. We should therefore study and inquire into the causes of the displacement of the ends of a broken bone, and of the several varieties of it, which may occur in different cases. In fact, without this knowledge, we should not be qualified to practise this part of surgery with reputation to ourselves and advantage to the public. First, then, I may observe, that a fracture may be without any displacement at all, as when the tibia is broken transversely a little way below the knee-joint: the bone is there so thick, that the fracture will scarcely admit of any displacement. Also, when the upper and thick part of the ulna is broken, and the radius is perfect, there is usually no material degree of displacement. The same fact is often exemplified when the upper portion of the fibula is fractured, while the tibia continues entire. The displacement may be either *immediate* or *secondary*. When immediate, it is produced by the same violence as produced the fracture: thus, the wheel of a heavy carriage may pass over a person's leg, and break it, and at once produce a displacement of the broken ends of the bone. A musket ball may have the same effect. Here the displacement is *immediate*. *Secondary displacement* may arise from two or three causes, the principal of which is the action of the muscles; but the weight of the limb will also be concerned in its production, if the injured part be not properly supported, or carefully carried. There are several kinds of displacement, in regard to the direction which it may take place; first, it may happen *in the direction of the diameter of the bone*, as seen in a transverse fracture. In such a case, the two ends of the fracture may be either partially in contact, or not at all: in the latter case, the displacement in the direction of the diameter of the bone must obviously be very considerable. In some cases, the displacement is *longitudinal*, as is most frequently noticed in oblique fractures, where the surfaces of the broken bones slip or glide over each other, the lower portion being generally drawn upwards, and the limb consequently shortened. But the *displacement* may take place *in relation to the axis of the bone*, the two fragments forming an angle, so that the axis of one portion of the bone does not correspond to the axis of the other fragment. This is termed the *angular displacement*. A fourth description of displacement is the *rotatory*, in which the lower fragment of bone is twisted inwards or outwards. Thus, in fractures of the thigh-bone, the lower portion of it will generally be twisted or rotated outwards by the action of the muscles and the weight of the foot. A fifth description of displacement is not seen in the generality of fractures, but only in particular ones; and consists in the upper detached portion of a fractured bone being drawn away from the lower part of it by the muscles attached to it. Examples of this displacement are seen in the fractures of the olecranon and patella, in which the muscles draw up the upper fragment away from the rest of the bone.

With regard to *the causes of* these several forms of *displacement*, they are of various kinds: a bone is often broken by a fall; but sometimes by blows or kicks; the fall following the fracture and aggravating any displacement, which the injury, producing the fracture, may already have caused. In some instances, the weight of the limb may displace the fracture of both bones of the leg, if the limb be laid upon its outer side, and the lower part of it be not duly supported, there will be an inclination of the inferior part of the tibia too much outwards. But, of all the causes of displacement, the action of the muscles is by far the most common, the most powerful, and the most difficult to counteract. Its usual effect is to draw the lower portion of the fractured bone upwards, or to make it, as the phrase is, *ride* over the upper fragment. The muscles, principally concerned in causing the displacement, are those, whose insertions are below the fracture. Thus, when the humerus is fractured between its head and the insertion of the pectoralis major, this muscle, together with the latissimus dorsi and teres major, will draw the lower portion inwards. The fibres of the deltoid, it is true, may have some tendency to pull the upper fragment outwards; but it is the muscles specified which have the greatest share in occasioning the displacement. The same principle lets us understand, why it is so troublesome to maintain the lower end of the fracture in its right place, when the thigh is broken; for the muscles of this part of the body are remarkably strong and numerous. Arising from the pelvis, which they make their fixed point, they are inserted into the femur below the fracture, and also into the patella and bones of the leg, which parts are their more moveable attachments, and consequently disposed to be drawn up by them more or less towards the pelvis. In fractures of the leg, the gastrocnemius, the soleus, and the peronei muscles, all tend to draw the lower portions of the fractured bones to the outer and posterior side of the upper fragments.

Prognosis. Those broken bones which have the greatest number of muscles attached to them are usually the most difficult to repair without deformity, because the muscles are the principal cause of the ends of the fracture being displaced; and when the muscles are numerous, or particularly strong, more difficulty is experienced in counteracting their influence.

Fractures of the long cylindrical bones, near large joints, are generally more serious accidents than other fractures situated in the middle portion of such bones, because in these no risk of inflammation of the synovial membrane, of abscesses, or anchylosis is induced, one or more of which consequences are exceedingly apt to supervene, if the fracture extend into or near a joint. *Compound* are more dangerous than simple *fractures* ; for, the inflammation is more violent, the constitutional symptoms more severe, and, if the wound in the skin cannot be united by the first intention, large abscesses may ensue, and the case will sometimes take so bad a course, as to render amputation necessary. Indeed, when bad compound fractures are cured, it is frequently not until after long confinement in bed, repeated abscesses, or even sloughing, many exfoliations, and severe and protracted hectic disturbance of the system. In compound fractures near the ankle, an anchylosis of the tibia and fibula to the tarsus, and of the bones of the tartus to one another, may follow. However, anchylosis is not the invariable consequence of a fracture close to a joint. A *communicated fracture*, and also one in which the bone is broken, not exactly into a great number of fragments, but only in two or three places, are more serious than if it had only been broken at one part. A similar remark applies to the case, in which there is a fracture in two different portions of the same limb, as, for instance, in the leg and thigh together; here it would be exceedingly difficult to effect a cure without deformity, far more difficult than if there were only one fracture in the leg or thigh. In *oblique fractures*, as the lower fragment has a tendency to glide over the upper one, the chance of deformity is more serious. *Longitudinal fractures of the cylindrical bones* are generally severe cases, because they rarely occur, except from the effects of gunshot wounds, and are liable to extend into joints. At one time, so few specimens of this sort of fracture had been preserved, that the reality of it was a matter of dispute; but it is now known by military surgeons that it frequently takes place, and Cloquet has given an account of some fractures of this kind, which occurred in individuals who had been crushed and buried in the ruins of a building. *Complicated fractures*, or those accompanied with a wound of a considerable artery, a dislocation, previous disease of the bones, or an insane and unmanageable state of the patient, or with various other perplexing circumstances, are rendered more difficult of cure by these complications. In the museum of the University College, is a preparation, exhibiting a fracture of both bones of the leg in two places, which accident was complicated with hemorrhage; the treatment tried was pressure, which, I think, afforded little prospect of success in preventing hemorrhage, either from the anterior or the posterior tibial artery. At all events, the result was mortification; indeed, injured in the degree in which the limb was, it was certainly in the worst possible condition for bearing pressure, which, besides being injurious to the soft parts, could have had little operation on either of the arteries specified, whichever it might be, that was the source of the bleeding. Here, if taking up the femoral artery were unadvisable, and cold applications would not have answered, it might have been better to have amputated at once, according to the rule which I mentioned when speaking of gunshot wounds, namely, that very bad compound fractures, accompanied by the injury of a considerable artery, are cases for immediate amputation. In this case, not only was the limb not saved, but the patient lost his life. Fractures of the lower extremities are generally more serious than fractures of the upper ones, for they are more difficult to reduce, and keep reduced a longer period of time for its accomplishment. Fractures in debilitated and aged persons do not get well so soon as in healthy and young people: in infants and children it is really surprising with what quickness and facility fractures are repaired, and this notwithstanding the impossibility of keeping such patients duly quiet and in the right position. Fractures of the neck of the thigh-bone, *entirely within the capsular ligaments*, occur most frequently in old persons. Now, partly from the patient's age, partly from the difficulty of maintaining the surfaces of the fracture in co-aptation, and partly from the scanty supply of blood to the pelvic fragment of the femur (the only supply of which is through the medium of the vessels of the round ligament), it is exceedingly difficult to bring about bony union, so difficult, indeed, that it was at one period often supposed to be impossible to effect it. When fractures are accompanied by certain diseases, as syphilis, scrofula, scurvy, rickets, &c., the prognosis should always be guarded; the friends of the patient should be apprised that the unfavorable condition of his health may have disadvantageous effects on the process by which nature brings about the union of a broken bone. I have, however, attended many ricketty children for fractures, and generally found that their bones unite again with tolerable readiness. In such individuals, the bones are more easily broken it is true, but I have not met with any very great difficulty in bringing about the reunion of them.

The danger of fractures depends more on the injury done to the soft parts, or on the state in which they are placed by the accident, than on the affection of the bone itself. The injury of the bone, abstractedly considered, is not dangerous; and whatever bad consequences follow, will mainly depend either upon the degree of mischief done to the soft parts, or upon the inflammation of such parts, excited by the same violence that broke the bone; or upon the irritation of them by the spiculæ and sharp projections of the fracture. In short, the principal evils to be apprehended, will depend on the condition of the soft parts, produced by the manner in which they are affected by the fracture, or else by the same force that occasioned the injury of the bone. This is illustrated by what takes place in a fracture of the sternum, ribs, cranium, or spine; here the peril manifestly arises from the injury done to the important organs, which those parts of the skeleton are designed to protect. A fracture of the cranium is in itself an occurrence not likely to cause a single bad symptom; but, if we take into the account the injury which may have been done to the brain, we shall see where the real danger lies; and, in the same manner, if we reflect, that when the ribs are broken, the lungs may be injured, or that when the vertebræ are fractured, the medulla spinalis is likely to be wounded or compressed, we discern at once that the danger depends not so much upon the state of the bones, as upon the effects of the accident upon other organs.

In the *treatment of Fractures*, several minute circumstances present themselves, which some persons may think of little importance, but which, as Dupuytren observes, being neglected, may lead to serious consequences. Thus, the precautions to be taken in stripping the patient of his clothes, and in transferring him from one place to another, so as to avoid subjecting him to cruel sufferings, and the aggravation of injuries already done to the soft parts; the situation, in which the patient should be placed; the form and degree of hardness or softness proper for his bed during the treatment; the manner in which the surgeon should proceed to dress his patient; the means of ascertaining the consolidation of the callus; and the advise to be given in this stage, are all so many points, which experience pronounces as needing great attention. If the case be a fracture of the leg, the patient's boots and stockings ought to be slit up, and not drawn off. If he be carried on a litter, or on a door, as the celebrated Pott was, the surgeon need not be in a hurry to remove him from it, until his clothes have been taken off, the bed well arranged, and the requisite apparatus has been prepared. In lifting the patient to the bed, an assistant must take the patient round the body, another by the lower extremities; while the surgeon, or some other careful person, must take charge of the fractured limb. In fractures of the lower extremities, the patient should lie upon a firmish, unyielding bed, and his pillow is not to be large and high, which would cause him to slip downwards, and alter his position.

The *first indication* is the *reduction* or *setting of fracture*, by which is meant, the bringing of the fragments into their proper situation, in relation to one another. Technically speaking, it is performed by *extension*, *counter-extension*, and *coaptation*. *Extension* means pulling the limb in the direction away from the trunk, in order to obviate the retraction of the lower fragment. Now, it must be evident that, if extension alone were employed, the whole limb and the body too would yield, and be drawn in the same direction, and the patient would perhaps be pulled off his bed; it is necessary to prevent this inconvenience, by what is called *counter-extension*, that is, by pulling the upper part of the broken limb in the opposite direction. I need scarcely say, that some cases will not require extension and counter-extension at all; there may be no displacement, and then such proceedings would only be putting the patient to useless pain. Extension, counter-extension, and coaptation, when they are necessary, should always be performed with the greatest possible gentleness, no more force being exerted than is absolutely indispensable. Whenever there is displacement, they are manifestly proper; but, under other circumstances, that is, when a bone is broken, and the ends of the fracture are not at all out of their right position, the attempt to make better what is already right, is too absurd to require any comment. Modern experience teaches us also, that not one quarter of the force is necessary for the purpose of reducing broken bones, than was formerly resorted to, because surgeons of the present day avail themselves of the advantages, derived from the relaxation of those muscles which have the chief power of displacing the fragments. Thus, in a fracture of the bones of the leg, the powerful muscles of the calf are relaxed by bending the knee, by which means the displacement may be obviated with little difficulty, and with the employment of less force, than would otherwise be necessary. The same thing is illustrated in the case of a broken thigh; but here the exact position, which, in Pott's opinion, has the greatest effect in relaxing the principal muscles, capable of disturbing the fracture, is unfortunately not that in which the most effectual mechanical means for maintaining the reduction can be employed. The principle of relaxing the muscles, therefore, I think, should not completely preponderate over all other influential circumstances. It was noticed by Desault, that what is gained by the relaxation of one set of muscles, is lost by the increased tension of others: this is another fact, which should not be forgotten, and, at all events, in whatever position the limb is placed, there is an abundance of muscular fibres capable of producing a considerable and very troublesome displacement of the fracture. This circumstance deserves particular attention, because it enables us to understand, that we must not depend entirely upon position for effecting the end we have in view, but that we should bring to our assistance every other means within reach. As in oblique fractures of the long bones, there is mostly considerable displacement, greater extension will be demanded, than in the case of a transverse fracture. The latter kind of accident generally requires but little extension, merely just what is sufficient to lessen the friction and pressure of the surfaces of the fracture against one another at the period of coaptation; indeed, in such a case, there is seldom any retraction, and whatever displacement exists is of other descriptions.

When extension and counter-extension are practised to obviate the retraction, or shortening of the limb, no unnecessary force should be exerted; the bone should be pulled steadily and gently in the natural direction of its axis, until it resumes its proper length, and then the two ends of the fracture are to be adjusted, or, in technical language, *coaptation* is to be performed. From an early coaptation of the ends of a fractured bone, the patient will experience much less pain than from the operation at any subsequent period, because inflammation has not yet had time to commence. Severe spasms are noticed by Dr. Houston, as sure to be the consequence of extending a fractured limb, that has lain for any time in the fixed position. "Yet," says he, "even with the certainty of giving rise to temporary suffering of this kind, I would not be deterred from the operation, having often found, even after spasms, pain, and high inflammation had set in, by bringing the broken fragments properly together, and placing them so that no motion could take place between them, that a check has been given to the cramps of the muscles, and relief from pain procured. The momentary suffering, caused by such a procedure, will be amply repaid by the subsequent ease, and good final result."* The maxim of always setting a broken bone as soon after the accident as possible, and that of not allowing the displacement to continue, though inflammation may have come on, receive the approbation of all surgeons of judgment and experience. In certain cases, a good deal of trouble arises from continual spasms of the muscles; and, if the patients be strong and athletic, it will be advantageous to bleed them freely, and put them under the influence of opium or morphia, and then the reduction will be more easily accomplished and maintained.

Dr. Houston has published some interesting cases and remarks in favor of treating fractures of the lower extremity in the straight position. This position, he maintains, is the best for stopping the spasms, which, in many cases, prove a source of considerable suffering and perplexity. He argues, that the spasmodic contractions of the muscles surrounding a broken bone, appear to be wholly the result of the unusual condition into which these organs are thrown by the loss of the customary support of the bone, and aggravated, perhaps, in some instances, by the irritation of pointed fragments. In fractures of broad portions of bones near joints, as of the condyles of the femur, head of the tibia, or lower end of the humerus, and in fractures of one of the bones of the leg, or forearm, he finds, that patients scarcely ever complain of startings in the injured limb, because, in such examples, notwithstanding the fracture, the muscles enjoy a mechanical support, which keeps their origins and insertions at fixed distances apart. Taking a completely opposite view to that of Pott, Mr. Houston believes, that the primary cause of spasms of the muscles in fractures is the loosening of one or other of their fixed points of attachment, and that, by leaving them in a loosened state, or giving one set of muscles a greater degree of relaxation than another, such as is communicated to the flexors, by bending the limb, a check to their movements is not likely to be produced. Dr. Houston considers it well proved, that no degree of injury unless accompanied by fracture, is followed by spasms of the kind here alluded to; that no fractures, except those of the limbs give rise to those spasms; and that, even in the latter examples, if the ends of the fracture are so circumstanced as not to admit of derangement from the action of the muscles, there will be no spasmodic affection of the limb. Hence, he makes the following inference, that, for the prevention and relief of this harassing symptom, the fragments should be restored to their original places, and immovably retained in them, all hurtful pressure being avoided.*

---

* See Dublin Journ. of Med. Science, vol. viii. p. 490.

The *second indication consists in preventing the return of the displacement;* or, in other words, *in keeping the ends of the broken part of the bone steadily in contact*, so that *nature may have a favorable opportunity of uniting them.* This indication is so plain as hardly to require explanation: the ends of the fracture must be kept motionless; for, if this rule were neglected, they would not be united by osseous matter, but an artificial or false joint be produced by the ends of the fracture becoming smooth, and joined together by a soft ligamentous substance. With the view of promoting this motionless state of the fracture, and keeping the muscles quiet, Pott and his numerous followers prefer maintaining the limb in fractures of the thigh and leg in the bent position; while others, as Dr. Houston, decide against this method, and insist upon it as a fact, that relaxation of the muscles, having a tendency to spasmodic contraction, excites and promotes such contraction; whilst, on the other hand, extension of them is declared to be the most likely way of preventing or subduing the spasmodic action. Instead of adopting this explanation, I feel assured, by long experience, that the straight position is generally the most advantageous for a broken thigh, not for the reasons given by Houston, but because it admits of a more efficient apparatus being applied than can be used in the bent position, and especially in the posture so erroneously advocated by Pott. In the extended position, Dr. Houston observes, the patient sooner becomes reconciled to the bed than in the bent one; he can be shifted more readily, so as to vary the points of contact between his body and the bed, and thus save himself from excoriations, or sloughing; he can assume the sitting posture, and maintain it with less fatigue, for a considerable time. A better judgment may also be formed of the length and shape of the broken limb, by its admitting of a comparison with the sound one. The limb can be kept more steady; and extension, if necessary, can be more readily and effectually practised.* These observations, I think, apply more properly to fractures of the thigh, than those of the leg, which seem to me to be treated with the greatest possible success in a slightly bent position of the knee on M'Intyre's apparatus.

---

* See Houston's "Obs. in Dublin Journ. of Med. Science," vol. viii. p. 477. *et seq.*

For the purpose of keeping a broken bone motionless, we have recourse to various mechanical means, consisting, generally, of long thin portions of wood, tin, or pasteboard, termed *splints;* together with pads, compresses, cushions, and bandages. Instead of splints, the use of plaster of Paris casts, and of what the French term *l'appareil immobile*, is sometimes advocated as the best means of fulfilling this second indication, especially in the treatment of fractures of the leg; but, for reasons which need not here be considered, this plan cannot be said to gain much ground. At the same time, the principle is universally acknowledged, that when once a fracture is properly set, the less the apparatus is meddled with the better, unless particular circumstances occur to render an examination of the part necessary, or some alteration of the limb, or the applications to it indispensable. These contrivances form what is called the *apparatus* for fractures. According to Desault, the moderate pressure of a bandage on the surface of a fractured limb assists in preventing cramps of the muscles of a broken limb; and this principle, which is also commended by Dr. Houston, is commonly acted upon in practice, except when the degree of inflammation present renders such pressure unadvisable. In order to prevent the hard splints from hurting the skin, we interpose between them and the integuments some kind of soft materials, such as pads filled with tow, wool, or chaff of oats, which is preferred in France. In fractures of the shoulder, and of the bones of the upper extremity, a *sling* is another contrivance of great service; for it not only supports the limb in the most desirable position, but keeps it as quiet as the leg would be by confining the patient in bed. In other words, a sling is as useful for fractures of the upper extremities, in keeping the parts quiet, as the recumbent position is for fractures of the lower limbs, with this additional advantage, that, as the patient is not confined in bed, he can take exercise, and his health is less likely to suffer. The sling should never be omitted, when the clavicle, scapula, humerus, bones of the forearm, or those of the metacarpus and fingers, are broken.

---

* See Houston's "Obs. in Dublin Journ. of Med. Science," vol. viii. p. 489.

Sometimes almost every thing is effected by the relaxation of certain muscles, or by position, without splints, which could not act either directly or effectually on the fracture. For instance, in fractures about the shoulder, affecting the scapula or clavicle, the treatment is conducted altogether without splints. Then, in certain other cases, splints are indeed used, not as a temporary substitute for the bone, nor as a means of giving support and steadiness to the part for a time, but for the sake of keeping the limb in a particular position. Thus, in fractures of the neck of the thigh-bone, splints are used, not to support that particular part of the bone, but to maintain the limb quiet in a determinate posture. In fractures of the patella and olecranon, the same fact is illustrated: in these cases, splints are not employed on the principle of affording lateral support, as in a common fracture of the thigh or leg, but to retain the limb in a particular posture. Here splints could have no direct action on the fractured part.

Besides bandages, pads, compresses, and loops of tape, other contrivances form parts of the apparatus for fractures, as, for instance, what is called the *double oblique plane*, on which the lower extremity may have the advantage of the bent position, though the patient lies on his back: it is often used for fractures of the leg, and of the neck of the femur, and for oblique, and other fractures of the shaft of that bone. The *foot-board* is an essential part of the double oblique plane, as without it the limb would receive but indifferent support. In general, the foot-boards of the best double oblique planes are so constructed, that their situation and the angle of them can be altered and regulated according to circumstances. *Fracture-beds*, or beds invented expressly for the accommodation of patients with bad fractures, *fracture-boxes*, and contrivances to keep off the weight of the bed-clothes, called *fracture-cradles*, are other mechanical aids sometimes resorted to. Thus, in fractures, when much inflammation exists, the patient frequently cannot bear the weight of the bed-clothes; and then the cradle is found convenient. Common beds, intended for the reception of patients with fractures, should be furnished with hard unyielding mattresses, and not soft feather beds, which soon sink in the centre, and not only have an unfavorable effect on the patient's posture, but render his condition very uncomfortable. Fracture-beds are now brought to great perfection; and when the patient is likely to be confined for a long time with a severe compound fracture, or a fracture of the spine or pelvis, I would recommend him to procure, if possible, a fracture-bed, which will enable him to obey the calls of nature without any disturbance of his body or limbs, and which, if necessary, may be converted into a double oblique plane. It also allows the head or chest to be raised or lowered without the slightest disturbance of the fracture, or any effort of the patient himself, who may even be inclined to either side, if such posture be required, in an equally quiet manner. What is termed a *fracture-box* is intended to hold the limb securely and steadily, with the assistance of cushions and pads; it consists of a bottom-piece, two sides, and a foot-board; a soft cushion, or pad, is laid along the bottom of it, and the lateral pieces, which have hinges, and are fastened with straps, are also kept from hurting the integuments with soft cushions or pads, calculated to fill up the interspace between them and the limb. A fracture-box is of great service in the treatment of some bad compound fractures, requiring to be dressed every day; but in University College Hospital, it is not employed, because M'Intyre's apparatus, there preferred, answers every purpose.

Process by which broken bones unite. A solution of continuity in the soft parts unites with wonderful quickness, the cure by adhesion taking place in a few hours. The process of union in bones is slower and more complicated, nature requiring a longer time for the reparation of a fracture than for the union of a wound, and the process not being, in the first case, so simple, clear, and manifest. Even at the present day, with all the assistance of experiment and actual dissection, different statements and theories, are advanced by different authorities. A few years ago, lecturers on surgery got over this subject very easily, and those teachers, whom I happened to attend, explained the matter in a concise and summary way, by stating, that the only difference between the union of bone and that of soft parts, was, that the coagulating lymph, effused between the ends of a fracture, gradually acquired the consistence of cartilage, earthy matter was deposited in it, and thus the bone was united, and acquired its former strength, the only particularity being in fact the deposit of phosphate of lime in the uniting medium. But, even before the time alluded to, considerable progress had been made in the investigation of the process by which broken bones unite, and great merit is due to Du Hamel for the success with which he examined this part of surgical pathology. After making numerous experiments to ascertain the steps adopted by nature in uniting broken bones, he inferred that the periosteum and the medullary membrane were the sources of the new bony matter, or *callus*, as it is called, or the substance which was the means of union. The periosteum and the medullary membrane he considered as the exclusive organs of ossification. He maintained that, in the process by which a broken bone is united, the periosteum, covering the end of one fragment, grows to that of the other, and then swells and forms a rising round the fracture. In the swelled portion of the periosteum, he described vessels as becoming developed, and depositing specks of osseous matter, which formed a kind of osseous ferule, or hoop, directly round the fracture. Now this explanation partly agrees with later observations, and especially with those made with so much care by Baron Dupuytren. Besides the changes leading to the production of the *external callus*, Du Hamel found, that the medulary membrane was not inactive, but contributed its share to the promotion of union in nearly the same degree as the periosteum. One error in Du Hamel's theory, however, was the supposition, that the bony ferule would permanently remain, as the bond of union. It is occasionally asserted, that the periosteum is exclusively the organ of ossification. Without entering into a minute consideration of the objection to the latter opinion, be it sufficient to say, that callus, or new bony matter, is often produced in parts where the periosteum is totally destroyed; and it is well known, that the patella may be united by bone, although it is not furnished with a periosteum at all; it is true, that it rarely unites by osseous matter, when broken transversely, but when it is fractured by external violence, or in the longitudinal direction, osseous union is not an uncommon result.

Bordenaave, having had an opportunity of examining a bone that had been formerly broken, and long united, and, finding no bony ferule in the situation of the previous fracture, conceived that Du Hamel had been mistaken, and he therefore espoused the doctrine, that union is accomplished by the vessels of the bone itself, and that they effuse coagulating lymph between the ends of the fragments, which lymph is first converted into cartilage, and finally into an osseous consistence. Baron Larrey also rejects the theory, that the periosteum is the organ of ossification, and he adverts to examples, where, although portions of the cranium had been removed, and the pericranium had been destroyed to a considerable extent, nature made considerable efforts to repair the loss. In young subjects, especially, such efforts may indeed accomplish a great deal, and, I think, we must acknowledge, that the facts and arguments, brought forward by Larrey, amount to a refutation of the opinion, that the periosteum is exclusively the organ of ossification. The experiments of Dupuytren, Villerme, and Breschet prove, that all the doctrines to which I have adverted are too limited; for, whenever a bone is broken, the soft parts around the injury are more or less contused and torn, and it is alleged, that only the periosteum and medullary membrane, but also the soft parts around the injury are more or less contused and torn, and it is alleged, that not only the periosteum and medullary membrane, but also the soft parts around the fracture, the cellular tissue, and muscles, or rather their vessels, are concerned in repairing the injury of the bone. It was found, that when the ends of the fragments were kept steadily together, they became surrounded by a swelling and a subsequent ossification of the soft parts, and that, in this manner, a kind of external case was formed to include and support the ends of the bone. This first production corresponds with Du Hamel's bony ferule; for, as I have said, he noticed that a sort of bony hoop is produced around the fracture. Dupuytren calls this hoop or ferule the *provisional callus*, because it is only a temporary production, and is absorbed as soon as it has fulfilled the purpose for which it is designed, namely, that of acting as a splint, or means of support to the broken part of the bone, until nature has had time to bring about a more complete and direct union of the ends of the bones themselves.

In the *first stage*, then, of the union of fractured bone, comprising a period of about ten days, there is merely a swelling of the soft parts around the fracture; and, on examination of the limb in the dead subject, the swelling appears to consist of a reddish substance, as would seem from the quantity of blood effused. The swelling is greatest or thickest opposite to the fracture, and gradually diminishes above and below the injury, till it is completely lost in each of these directions. About the *tenth day* the redness has disappeared, the blood being now absorbed, and coagulating lymph effused. At this time, a reddish vascular spongy substance is formed between the ends of the bone, which substance is not itself of an osseous nature; but in the swelling, around the fracture, specks of bone now begin to be deposited, a change, or new action, characterising the beginning of the *second stage*, which extends from the tenth until the twenty-fifth day. During this second stage, then, the effused lymph on the outside of the fracture becomes ossified; it at first assumes a fibrous structure; it then becomes cartilaginous; and by degrees, calcerous matter is deposited in it. In the meanwhile, similar changes are going on in the medullary membrane, so that, in the process of union, nature is laboring without and within the bone to give it a temporary means of support, and steadiness, while the principal and permanent work of ossification is as yet only preparing for commencement.

The bone is still capable of partial flexion; the ends of the fracture not being yet consolidated.

In the *third stage*, extending from the twenty-fifth day to the end of the sixth or eighth week, the external swelling becomes completely ossified and firm; the internal medullary membrane undergoes the same change; but the ends of the fracture are not united, and the bone is only strong from the support received from the external and internal osseous formations. The ends of the fracture themselves are not yet consolidated directly together, and the bone may still be broken again, or bent, by any violence or weight applied to it in a careless way.

The *fourth stage* extends from the sixth or eighth week to the end of the fifth or sixth month, during which time the external or provisional callus has become completely ossified, and even covered with periosteum. The ossification of the medullary membrane is also perfected; and the ends of the bones themselves being now truly united to one another by bony matter, the former solution of continuity is hardly distinguishable.

The *fifth stage* reaches from the fifth or sixth month to the twelfth.

During this period, the external provisional callus is absorbed and removed, and the direct union of the fragments is so strong, that it would be as difficult to break the bone in the situation of the former fracture as in any other place. For a certain time after the injury, the medullary cavity is filled up by a kind of internal provisional callus, obliterating, as it were, the cavity of the bone. These final changes take place in the interval between the sixth and the twelfth months: then all irregularities are removed; the external callus is absorbed, and the medullary canal restored.

In the museum of the College of Surgeons, there is a bone which is united in such a way, that a portion of the medullary cavity is turned outwards, instead of inwards, a large splinter having been entirely detached: yet union took place. Long splinters and fragments frequently unite, but they sometimes perish, and fall into the state of necrosis.

The source of the external provisional callus is not then exclusively in the vessels of the periosteum; the surrounding cellular tissue and muscles having a share in the production of it, and this, in a still greater degree, when the ends of the fracture are considerably displaced. The formation of the definitive, or permanent callus, which follows that of the temporary one, is not completed till the eighth, ninth, or even the tenth month after the accident; but as, when it is finished, the provisional callus becomes unnecessary, nature then takes away, not only the external provisional callus, but also that which is formed in the medullary cavity, and this becomes restored to its original state. All these changes, however, are not brought about until long after the occurrence of the fracture, much longer than was formerly supposed.

The provisional differs from the definitive callus, not only in its situation and duration, but also in its lesser consistence and solidity. When it is finished, it only possesses the strength necessary to resist the action of the muscles, and the weight of the part; nay, there are cases in which, on the removal of the splints, it will yield to these two forces, especially in oblique fractures; and it is of consequence for the surgeon to recollect this fact, namely, that the limb may be straight so long as the splints remain applied, but that from the too great weight on the limb, or the too powerful action of the muscles, after the removal of those supports, deformity may still ensue. If the splints are removed too soon, or the part be used too roughly and boldly, while the strength of the fractured bone depends entirely on the external and internal provisional calli in a certain stage of their formation, it is possible that a degree of deformity may yet follow. Sometimes the strength of the provisional callus will be overcome by a shock or blow, or some other form of external violence, and sometimes by the effects of constitutional disease. I have seen patients with bad fractures, whose limbs had proceeded a certain way in the process of cure, when they were attacked with fever, and the provisional callus was so weakened, that it admitted of being bent with facility, though it had previously been quite inflexible. This fact proves that the provisional callus is weaker than the definitive one; and the knowledge of it is useful; for, supposing a limb to be badly set, if the provisional callus has only advanced to a certain stage, an attempt may yet be made to improve the shape of the limb. This has been done in France, with success; yet it must be manifest, that the older the provisional callus is, the more difficult will it be to amend the shape of the bone, for the callus becomes firmer and more unyielding in proportion as its ossification is more advanced. The definitive callus, though less bulky than the provisional one, is harder, stronger, and more compact, being indeed, when it is perfectly finished, stronger than the rest of the bone; and, if the bone be broken again, the fracture will not be in the situation of the definitive callus. Leaving out of present consideration the effects of scurvy, I may say, that the definitive callus is never destroyed by disease: in this respect also, it is stronger than the provisional callus, and whatever deformity may exist in the limb after the definitive callus is formed, cannot be lessened.

Hitherto I have been considering chiefly the process of union in simple fractures of the long cylindrical bones, which have been properly set. When the two ends of a fracture are in apposition only at one point of each of their surfaces, it can only be at this point that there can be any definitive callus of the ordinary kind; but, as a compensation for this disadvantage, the external callus is never entirely absorbed, but remains as a substitute for what would be the definitive one under common circumstances. When the two surfaces of the fracture are not at all in contact, but the ends of the bones touch one another laterally, strictly speaking, there is no provisional callus. In such a case not only the periosteum, but the vessels of the adjacent cellular tissue and muscles, assist in the work of producing new bone, by which the two fragments are to be connected. The side of one fragment here becomes soldered by osseous matter to the side of the other, and whatever new bone is formed for this purpose, remains permanent, or, in other words, is a definitive callus. Lastly, in compound fractures, attended with suppuration, the bones remain disunited for several weeks, and then union takes place in a different manner from what I have been explaining. In this instance, no provisional callus is produced; but at the end of several weeks, the ends of the bone soften and granulate, and in proportion as the secretion of pus subsides, the granulations of the surface of the fracture deposit osseous matter, or, as the French pathologists say, they are themselves converted into bone. It appears then, that the process of union in compound fractures is different from what it is in simple ones; and it will generally be found that the greater the degree of displacement of the fracture, and the greater the injury done to the surrounding soft parts, the less will the work of producing the external provisional callus be confined to the periosteum.

Broken cartilages do not unite by cartilage but by bone; osseous matter is deposited around the part, forming a kind of hoop or ferule, which is alleged to be formed by the vessels of the perichondrium. This mode of union is exemplified in fractures of the cartilages of the ribs. Fractures of the patella, olecranon, condyles of the humerus, and coronoid process of the ulna, generally unite by means of a fibrous ligamentous substance, and the acromion, when fractured, may also unite in the same manner.

Different bones require different lengths of time for the union of their fractures. In the upper extremities, fractures are sooner cured than in the lower ones; the ribs and clavicle are generally united with tolerable firmness in about a month, and even sooner in young subjects. Fractures of the humerus require about six weeks for their reparation; but those of the tibia and femur are not firmly united before the eighth week. When I speak of bones being *firmly united* at particular periods, I allude only to that firmness which is derived from the provisional callus, and do not mean that the definitive callus has been produced. The latter work, which may be regarded as the completion of the cure, is one that is not accomplished till a much later period.

The time required for the union of a broken bone will also be much influenced by the age of the patient, his state of health, the kind of fracture, and the efficiency or inefficiency of the treatment. A compound fracture, and a very oblique fracture, are longer in uniting than a simple one, which is either transverse, or of less obliquity. In infants, a broken bone will make as much progress towards a cure in a week or ten days as it would in a month in an adult. When the bones of infants happen to be broken during parturition, they are generally united with considerable firmness in a week or ten days. The tendency to quick union is strongly evinced during the development of the skeleton, that is, while the individual is growing; and, I may say, that it is most considerable while this development is taking place with the greatest vigor. Hence the impossibility of keeping children quiet does not seem to interrupt the process by which a fracture unites; and however much they may move and toss themselves about, the injury is generally repaired with wonderful expedition. This is a circumstance which should always be remembered in the treatment of fractures in children; for, if these accidents are not vigilantly attended to during the first ten days, and the position of the broken bone is neglected, we may afterwards find the process of union too far advanced to admit of the shape of the limb being rendered better again. Circumstances are different in the adult, in whom the ossific process does not actually commence till after the tenth day; a fact which led Sir

Stephen Love Hammick, and some other surgeons to defer the application of splints during such space of time, and merely to employ cold lotions, with the view of keeping down inflammation. This practice would not be advisable in children; for, after the ten days had elapsed, we should most frequently have to regret the omission of splints, by means of which, in the early stage of the accident, we might have had effectual command over the shape and direction of the limb, but which would now perhaps be irremediably deformed.

As a general rule, Dupuytren recommended the apparatus to be kept on for twenty-eight, or thirty days, in children; forty in adults; and a much longer time in aged persons. It ought not to be removed until we have ascertained that the consolidation is complete. In order to be sure of this, the surgeon lays hold of the two fragments, and cautiously tries if he can produce any motion between them. If the callus yield, the apparatus must be reapplied immediately; if it do not, the splints may be discontinued, and the part merely supported on each side with a piece of thick pasteboard. At this period, it will not be safe to let the patient walk immediately; for the callus may give way under the weight of the body, or the action of the muscles. He must be kept quiet in bed for ten days, or a fortnight longer. He may then sit up in his bed, or in an arm-chair, with his limb rolled, and on a pillow. Crutches may next be given him, and they should be tipped with cloth to prevent them from slipping on the floor. If possible, the patient should not attempt to go up and down stairs, nor to walk in slippery or uneven places.

The process of union is retarded by old age, and by every temporary disturbance of the system: such as an attack of fever or erysipelas. The union then proceeds more slowly, or may even be completely suspended. The process is retarded also by several of those diseases which sometimes operate as predisposing causes of fractures; as, for instance, certain diseases which weaken the texture of the skeleton, or that of particular bones, the chief of which are rickets, fragilitas, and mollities ossium, cancer, scrofula, and, as some allege, the venereal disease in its advanced stages; but, with regard to this last disease, I must observe, that it is disputed whether the condition of the bones may not be brought on rather by the mercury which is given for the cure of the disease, than by the disease itself. Pregnancy is generally set down as one of the causes impeding bony union, and it is even asserted, that fractured bones in pregnant women will not unite until after delivery; but this is not always the case, for I once attended a woman who lived in the neighborhood of St. Paul's, who fractured both bones of her leg in the fifth or sixth month of pregnancy; yet I found that the fracture united favorably, and in about the usual time.

Another circumstance, sometimes retarding the union of a fracture, is the lodgment of a dead portion of bone between the ends of the two fragments. In the museum of University College are several preparations exhibiting this fact.

In the writings of Schmucker, an interesting case is related, in which a portion of dead bone was lodged between the fragments of a broken tibia, and retarded the uniting process for eight months; at the end of which time an incision was made and the sequestrum taken out, after which the union took place in three or four weeks.

The continuance of a fracture in a disunited state depends sometimes on constitutional causes, and sometimes on circumstances directly affecting the broken bone itself. Among the latter causes, I may specify a total want of apposition between the two ends of the fracture. If the bones do not touch at all, there will probably be no union, or more time will be required for it.

Another circumstance, contributing to prevent union, is moving the fractured limb too frequently, or even continually, by which the ends of the bone are prevented from being in steady apposition. We shall find a remarkable proof of this recorded by Baron Larrey. When the French army was retreating from Syria, there were among the wounded a great number of soldiers with compound fractures, whom it was neccessary to place on the backs of dromedaries and camels, in order that they might travel with the rest of the army: for if they had been left behind they would have been murdered by the Turks and Arabs. They were obliged to continue their retreat day and night for several weeks jolted very roughly in this mode of traveling; the consequence of which was, that many of these fractures did not unite by osseous matter, and were sent to Marseilles, a year after the period of the retreat from Syria, still uncured. Too much motion of a broken limb is, then, one of the circumstances impeding the favorable union of fractures, and occasions what is called a *false joint;* indeed, one of the principal indications in the treatment of fractures is to prevent all motion of a fractured part.

One occurrence, sometimes impeding the union of fractures, and first pointed out, I believe, in my writings, is the interposition of a portion of muscle between the ends of the broken part of the bone. I have been present at one or two dissections, in which the want of union was ascertained to be produced by this cause. In one of these instances, in which the humerus had been fractured obliquely, the lower fragment, the end of which was sharp, had been drawn up into the biceps muscle; consequently, there was no apposition of the ends of the fracture, as a quantity of muscle intervened between them.

The greater number of fractures, not uniting by bone, are either in the patella, neck of the thigh bone, or shaft of the humerus. With regard to the humerus, I may observe, that most of those fractures, which do not unite by bone, take place just below the insertion of the deltoid: here the upper fragment is pulled outwards by this muscle, while the lower one is drawn inwards by the coraco-brachialis. The failure of union, therefore, seems to depend upon the non-apposition of the ends of the fracture; and, perhaps, upon the disturbance by the action of the muscles in question.

Besides these cases, false joints or union by ligament may also happen in other bones, or other parts of bones; thus sometimes a fracture of the shaft of the femur will not either unite by bone at all, or very tardily; fractures of the lower jaw may fail to be reunited by osseous matter, or the process may be very late in its completion. A few years ago, there was a man in the Queen's Bench with a fractured radius, which had been in that state a long while, and there was not the slightest degree of bony union. A fractured tibia, too, will sometimes not unite in the regular way. I have seen two cases which did not unite by bone for nearly two years, though they were both simple fractures.

From these general observations on the *first* and *second indications* in the treatment of fractures, and on the nature of the process by which broken bones are reunited, I now proceed to the consideration of the *third common indication.* After the broken bone has been reduced, or set, and means have been taken for retaining the ends of the fragments in apposition (for these are the objects aimed at in the two first indications), it is necessary, in the next place to attend to any unpleasant symptoms or circumstances likely to arise, or which may have already followed; for example, there may be an unusual degree of pain from various causes, swelling from effused blood, a severe degree of inflammation, erysipelas, the formation of abscesses, &c. Now any or all of these circumstances may follow the setting of a fractured limb. When pain occurs, we ought to ascertain, that it does not arise from the immoderate pressure of bandages, or badly padded splints. In either of these cases, the mode of relief is manifest enough; we are to undo the bandages, and either leave them off for the present, or put them on again in a more skilful manner. For the prevention of inflammation, the chief means is undoubtedly quietude of the part, which the favorable progress of the cure requires on another account, namely, for the purpose of preventing the displacement of the ends of the fragments; but, while quietude is enforced, other measures should not be neglected; as, for instance, low diet, which, however, can only be continued for a few days, because its effects will be to retard the formation of the callus, in the same manner as too much bleeding, or any other weakening plan, is known to do. For fractures abstractedly considered, bleeding is never requisite; but we bleed when the injury of a bone is attended with much contusion of the soft parts, a description of mischief generally greatest when the fracture has been produced by direct violence, as by a blow, or a kick.

Hence, considerable swelling, and sometimes laceration of the skin and muscles, are often produced by the same violence which breaks the bone. Under these circumstances, the bandages and splints should never be tightly applied at first; and sometimes it is most advisable to refrain from making any kind of pressure with them till the inflammation has subsided, and have recourse to cold evaporating lotions, and bleeding, in a degree proportioned to the patient's age, strength, and constitution, or to the violence of the contusion. Under such circumstances, many good surgeons do not think it right to apply splints at all for some days, but endeavor to keep off and subdue inflammation by means of cold evaporating lotions, bleeding, and leeches; they put the limb or part in an eligible position, and, applying no bandages, merely lay a piece of linen on the part wetted with the cold lotion. The practice of omitting the use of splints in the early part of the treatment is not generally commendable, though the inflammation and swelling may occasionally render it indispensable. As the common maxim, I should say, that the sooner the splints are put on the better; but they must not be applied too tightly at first. As for bandages they had better not be put on when much inflammation and swelling prevail; folded linen, wetted with a cold lotion, will be much more useful, and not attended with risk of doing harm. Costiveness should be obviated; but as fractures of the lower extremities are liable to a hurtful degree of disturbance from frequent purgation, it is not advisable to carry the practice thus far. Leeches and cold lotions are the best topical remedies for the inflammation in the early stages of fractures; after a time, if there be any disposition to the formation of abscesses, fomentations and even poultices may be applied, but leeches and cold lotions are often preferable in the commencement of the case. We must not, however, allow too much disturbance of the limb to be produced by the employment of these, or any other applications; and if they cannot be put in practice, without this disadvantage, they had better be dispensed with. The best way of using cold lotions will be to squeeze them out of a sponge upon the eighteen-tailed bandage, roller, or folded linen, which may be upon the limb, so that the fluid may pass between the splints, and wet the bandage or linen without the splints being taken off at all. When the limb is well set, its position right, and the bandages and splints skilfully applied, the less it is moved the better; this may be set down as an axiom in surgery, and it is a principle, which is so much valued by Baron Larrey, that after reducing the fracture, and putting it into the proper posture, he then makes use of an apparatus, which is not taken off till the bone has united. This practice is followed even in compound fractures. The apparatus is soft and flexible at first, and being wetted with a solution of acetate of lead, to which is added a little camphorated spirit and white of egg, it is afterwards converted into a stiff firm case, precisely corresponding to the shape of the limb, and consequently well adapted to keep up equable pressure upon it, without chafing or hurting the skin. Baron Larrey was led to adopt this mode of practice, in consequence of the necessity he was frequently under of moving patients in the army from place to place with bad compound fractures; for, by means of the apparatus here referred to, they could be moved any distance with the greatest security; and I may state, that his son, who has published a treatise on fractures, and in recommendation of the same principles, gives an account of several individuals who were moved, with severe compound fractures, great distances without injury: one individual had been brought to Paris from a place a hundred miles distant, the day after the accident.

If no pain is produced by the splints and other parts of the apparatus, and the fracture is well set, the less frequently they are taken off the better. However, with the ordinary plans pursued in this country, it would be unsafe not to examine the limb now and then, and, more especially, between the tenth and twenty-fifth days; for, if the process of ossification in the provisional callus were allowed to go on beyond this period, the fracture might unite in a bad position, and such deformity be the result as would not afterwards be remediable. On the other hand, if the state of the limb be vigilantly attended to till the bone has *knitted*, as the expression is, less caution will afterwards be necessary, as the risk of the ends of the fracture changing their respective situations will now be considerably lessened.

UNUNITED FRACTURES.

Sometimes fractures continue for a long time without evincing any disposition to unite; and, in other instances, they loose all tendency to be consolidated by osseous matter, the ends of the bone becoming rounded and smoothed, and connected only by a fibrous ligamentous substance. Now, when this mode of union takes place, the case is said to terminate in the formation of an *artificial joint*. A main point in the treatment of such fractures as have continued a long time without osseous union, is to ascertain the cause of the deviation from what is the usual course of things; for here, as well as in every other part of surgical practice, the cause of what is wrong should be investigated, because, as it is removed, the effects will probably cease. Thus, if the continuance of a fracture in a disunited state were to depend on general indisposition or bad health, which could be removed, the cure of the injury of the bone would then, perhaps, admit of being accomplished; but sometimes the cause of want of union in the fracture, depends on a constitutional disease which is totally incurable. Thus, when no callus forms in a patient with cancer, there is little prospect of bringing about the union of the bone by osseous matter, because no means are known by which the original disease can be cured, or the patient's state of health materially improved. The same may be said of mollities and fragilitas ossium, and of some other constitutional affections, in which we have no means capable of leading to the re-establishment of a sound state of the constitution. However, many diseases, causing this backwardness in fractured bones to unite by osseous matter, do admit of cure; such are rickets, scurvy, and lues venerea in its advanced stages. In these instances we may hope, by proper treatment, to bring about such an improvement in the health as will be followed by a deposit of bony matter for the union of the fracture. It is certain, however, that diseased bones will sometimes unite. Sir Benjamin Brodie had a syphilitic patient, with an enlarged clavicle, which broke from some exertion of the arm, the fracture extending through the diseased part; yet this fracture united in the ordinary time. With regard to rickets, I have attended many children in this state with fractured limbs, and in all these examples, there was no remarkable indisposition of the broken bones to undergo bony union. Also with respect to a pregnant woman, whom I attended with a fracture of both bones of the leg, the bones united very well in about the usual time. I remember a woman in University College Hospital, who had cancer of the breast, and such fragility of her bones, that she had met with several fractures from slight causes. Twice she came into the hospital for such accidents, which ended favorably. Cases are met with, in which the formation of callus is kept back by illness excited by the state of the soft parts around the fracture, or occurring as an accidental complication. Thus there will sometimes be an attack of fever or erysipelas, in which events the formation of callus will be retarded as long as the general indisposition continues. Sir Benjamin Brodie has seen two cases where fractures did not unite, in consequence of the constitution having been impaired by a kind of voluntary starvation, to reduce the *embonpoint* of the individuals: he also suspects, that too tight a bandage may sometimes impede the process of union.

Dr. Houston regards the doctrine as not being well established, which ascribes the imperfection in the formation of callus to the want of inflammatory action. In illustration of this point, he recites the case of an old woman who broke her thigh, and after she had continued in the hospital several months without complaining of much suffering, the limb was surrounded with adhesive plaster, and she was able to walk about on crutches. "She did not, however, long survive her convalescence, and upon examination of the limb after death, it was discovered that, in addition to a transverse fracture of the middle of the thigh, a perpendicular one, four inches in length, ran up to the trochanter. The transverse lesion exhibited a perfect false joint, with fibrous capsule and synovial membrane, whilst the portion detached by the perpendicular fracture had become firmly and universally united to the original bone. The explanation usually given of the cause of such a failure, want of sufficient action, will not hold good in this case, as the action was fully competent to the reparation of the lateral fracture, though it failed in the transverse one. Want of proper apposition, and the frequent occurrence of motion between the two main pieces of the bones, were more probably the causes of non-union at this part."* Dr. Houston also adverts to an instance of a middle-aged man, in whom almost every long bone in the body had been broken at one time or another, from trifling causes; but notwithstanding great weakness of constitution, all these accidents were repaired with very little suffering, and in a moderate time. Unquestionably, there is sometimes great difficulty in explaining the cause of the failure of our endeavors to unite a broken bone; but generally some of the circumstunces, to which I have referred, will account for it.

When the want of union is owing to the fragments not being properly in contact, or to the fracture not being well set, or to its being moved about too much, then the indication will be obvious—the bone must be better set—the fragments must be put in a state of more accurate coaptation, and such an apparatus employed, and such quietude of the limb observed, as will more effectually and steadily maintain the reduction. However, these means will only answer when an artificial joint is not completely formed; for, after this has happened, no improvement of the general health, nor any means calculated to render the limb more motionless, will be attended with success.

If there were interposition of any soft parts, such as portions of muscle, between the ends of the broken bone, and we were sure that such complication was the cause of want of union, and could not get the ends of the fracture together by freely extending the limb, and altering the position of the bones, we should then be justified in making an incision, and dividing the muscle interposed between the ends of the bone; but, I believe, the diagnosis would never be clear enough to vindicate such operation. In the same manner, if a portion of dead bone, a *sequestrum*, as it is termed, were to intervene between the ends of the fracture, and to prevent union, or retard it for a great length of time, the indication would be obvious enough; we should be required to make such an incision as would enable us to remove the sequestrum. Some fractures do not unite by bone, or do not readily admit of osseous union, in consequence of anatomical circumstances. These are believed to have some considerable share in making it difficult to unite certain fractures of the neck of the thighbone by osseous matter. Fissures of the cranium are very slow in uniting.

---

* Dublin Journ. of Med. Science, vol. viii. p. 498.

When a fracture has remained a considerable time without union, and common measures have been found unavailing, various methods for expediting the process of osseous union have been proposed by surgeons. The most ancient is that of moving the ends of the broken bone freely upon one another, so as to excite a degree of inflammation in the parts about the injury; this plan has occasionally led to the establishment of the requisite process for the formation of callus. When John Hunter had occasion to treat patients in this condition, he sometimes made them get up and walk about with the splints on: I have seen this method tried at St. Bartholomew's Hospital, where it was not uncommonly resorted to at the period of my apprenticeship there. However, if an artificial joint be already formed, this plan will not have the desired effect, and other expedients will be necessary. One of these, first suggested by Mr. Charles White of Manchester, consists in making an incision down to the fracture, and dividing the ligamentous connexion, then turning out the two ends of the bone, and sawing them off; the limb being next carefully put up in splints, as in a case of recent fracture, and care taken that the two ends of the fracture are as correctly in contact as possible, and steadily thus maintained.

The first operation of this kind, performed by Mr. White, was attended with the most encouraging success: the case was one of a broken humerus, that had remained for a long time without bony union. The proceeding has been repeated by other surgeons, and with various results; sometimes the plan has had the desired effect, and sometimes it has not answered; nay, in certain instances, it has not only failed in procuring union of the bone, but occasioned loss of life. Richerand and Larrey mention cases which had this unfortunate termination. I remember a man in St. Bartholomew's Hospital, who broke his humerus, and the fracture, instead of uniting, led to the production of an artificial joint. In this example, Mr. Long cut down to the fracture and sawed off the ends of the bone; but, although this was most completely done, and the greatest care afterwards taken to keep the ends of the bone steadily in contact, no bony union followed. Of late years, therefore, surgeons have been more shy of resorting to White's operation, and not solely on account of its results having sometimes been so unfortunate, but also because another method has been proposed, which is, at all events, milder, if not more successful. The method, to which I allude, consists in introducing a *seton* between the ends of the disunited bone, in order to excite such inflammation in the situation of the fracture as may be followed by the formation of callus. Dr. Physic, of Philadelphia, proposed the seton, which he tried with success, first in a case of fracture of the lower jaw-bone, and afterwards in an instance of a broken thigh that had remained a long time without union. Experience has since proved, however, that the seton fails in a certain proportion of cases: I have seen two in which it did not answer, although it had had the fairest trial. The success of the seton is then very uncertain; but, as this latter plan is less severe than that of cutting down to the fracture and sawing off the ends of the bone, it seems to me to merit the preference. It may not answer; but its danger is not equal to that of the operation requisite to turn out the ends of the bone and saw them off. In some instances, however, the ends of the fracture were not sawn off, but merely scraped.

Instead of these methods, Mr. Amesbury thinks that another practice, which is still milder than that of the seton, will generally answer; namely, pressing the ends of the fracture methodically and strongly together; thus, when the humerus is broken, and the fracture is transverse, the pressure is made in the longitudinal direction, which is effected by means of a short sling, and an apparatus expressly calculated to fulfil the indication; but when the fracture is oblique, the pressure is made in the transverse direction, and with the requisite degree of force. This treatment has proved successful in several cases, and, as it is a mild and simple plan, I think that it ought always to be tried before the other more severe methods are resorted to. But, if an artificial joint were already completely formed, I should not expect that this mode of treatment would be effectual. When a fracture of long standing, and not united by bone, is dissected, the union is generally ligamentous, though the uniting substance differs from common ligament in not having a distinctly fibrous structure. In other cases, there is absolutely a false joint produced; the rounded ends of the bones are covered by a thin ligamentous substance, and the inner surface of the capsule is lined by a smooth membrane, like the synovial membrane, and, as Sir Benjamin Brodie observes, capable of secreting the synovia. It is only where the want of osseus union causes loss of the use of a limb, or other serious grievance, that any severe operation for the purpose of exciting ossification would be justifiable. A disunited fracture of the rib would not demand it; nor would some other cases promise any benefit from it.

COMPOUND FRACTURES.

When a fracture is attended with a wound of the integuments and other soft parts, which wound leads down to, and communicates with, the interspace between the two ends of the broken bone, the accident is of a far more serious nature, and more apt to be followed by severe and dangerous consequences, than when no such wound is present: the case being termed a *compound fracture*.

In a *compound* fracture, the wound is generally occasioned by the protrusion of one extremity of the fracture, except in gunshot fractures, and some others produced by direct violence. In gunshot fractures, the external wound is produced by the ball itself, or other substance, which breaks the bone; and, in some other instances, it may be caused by the same violence that breaks the bone, as when the accident is the result of the passage of the wheel of a heavy cart over the limb, or by the limb getting entangled in machinery. Under such circumstances, the same cause which fractures the bone may tear and mangle the soft parts, so as to occasion a wound communicating with the fracture. When the bone is broken obliquely, the extremities being sharp, one of them is very likely to be forced through the skin, particularly if the individual be intoxicated at the time of receiving the injury, and moves himself roughly and carelessly; also, if he be carried unskillfully by others, without the limb being duly supported, a protrusion of the bone will be likely to happen. In fact, many simple fractures are converted into compound ones, by the awkward manner in which the patient is carried after he has received the injury; and Mr. Pott, who met with a compound fracture of one of his legs, by his horse falling as he was riding through a crowded part of the Borough, was so impressed with the danger frequently produced by the manner in which patients are carried after accidents of this kind, that, as soon as his misfortune occurred, which was in the most populous street and greatest thoroughfare near London Bridge, he begged the by-standers, who surrounded him in great numbers, not to touch him until a door or some contrivance had been brought, on which he might be carried home without further harm.

When a surgeon is called to a bad compound fracture, the first question which he has to decide, is the same as that which must always be determined in the early stage of bad gunshot wounds, namely, whether the case will safely and judiciously, admit of an attempt being made to save the limb? In all bad accidental injuries affecting the limbs, and caused by external violence, the principles of treatment are the same. Therefore, what has already been stated with regard to this question, in relation to gunshot wounds, is also perfectly applicable to bad compound fractures. If, then, from the first, there seems no probability that the limb can be saved, it will be the surgeon's duty to amputate without delay. In fact, he will never afterwards have so good an opportunity of doing the operation with the prospect of saving the patient, because the constitution is now tranquil in comparison with what it will soon be when inflammation and fever have commenced. This principle I inculcated with regard to gunshot wounds, and it applies to compound fractures, as well as to all other bad injuries of the limbs from outward mechanical violence. If the present opportunity be neglected, there may never be another; because inflammation will come on, followed by fever, and sometimes by a rapidly spreading mortification; and, even if the patient were to live beyond the first stages and dangers of inflammation, he would yet have to encounter a series of profuse abscesses of great extent, and hectic disturbance of the most alarming kind. During the suppurative stage, when the patient has past through the first dangers, there might be, indeed, an opportunity of performing amputation, but one not so advantageous as what presented itself before the system had become universally deranged by the effects of inflammation, great suffering, and severe hectic disturbance. At all events, if the surgeon do not amputate immediately, he must not do it until suppuration is established, unless mortification happen to come on, in which event the case would be one of *traumatic gangrene*, where the practical rule is not to wait for the red line of separation. If an exception to the common maxim were not here made, the patient would generally die in twenty-four or forty-eight hours, without any line of demarcation having presented itself. But if an attempt has been made to save the limb, and it is frustrated by the formation of enormous abscesses, tedious and extensive exfoliations, frequent returns of inflammation, or attacks of erysipelas, or by extreme prostration of strength, and all the urgent symptoms which I have, on a former occasion, described as constituting hectic fever, tending to the patient's dissolution, the surgeon should then seize the best opportunity he can get of amputating the limb, because if he does not remove the cause of the hectic symptoms, the result will necessarily be fatal. How long he can rightly persevere in the endeavor to save a limb with bad compound fracture will, of course, depend partly on the state of the limb itself, and partly on the condition of the patient's health, the strength which he may retain, or the degree of hectic present.

I should not recommend amputation for compound fractures in the first instance, unless they were of the worst description; at this early period, the operation is only necessary when the bone is very badly shattered, and the soft parts extensively torn, or when a large joint happens to be seriously involved in the mischief. The superior skill with which compound fractures are treated at the present day, is productive of a remarkable degree of success, many limbs being now saved which formerly would have been taken off without delay. In fact, with all the advantages of private practice, and the judicious principles which prevail in this part of surgery, it is only the worst descriptions of compound fractures that call either for primary or secondary amputation.

Supposing it is decided to attempt the preservation of the limb, the first indication, after the reduction, is to endeavor to close the communication of the fracture with the atmosphere, and unite the wound by the first intention. In this object we sometimes succeed, but on other occasions fail, because the parts are more or less torn and bruised, and not simply divided. Sir Astley Cooper's plan is to cover the external wound with lint dipped in the blood, a mode of dressing which effectually excludes the air, and disposes the wound to unite favorably; but this method, unobjectionable as it may be, is not exactly the common practice, and most surgeons bring the sides of the wound together with strips of adhesive plaster, just as is done for the union of ordinary incised wounds. In University College Hospital, lint, wetted with tepid water, is frequently preferred. If we succeed in uniting the wound, then all danger is removed, the compound fracture being, as it were, at once converted into a simple one. In certain instances, the wound only unites partially, and the rest suppurates; yet, if inflammation be kept within moderate bounds, the case will generally go on favorably. In other instances, no union takes place at all, the wound sloughs, and large abscesses form; there will then be a great deal of constitutional disturbance, and the case will not be free from danger.

The reduction of compound fractures is conducted on the same principles as those which are observed in the reduction of simple ones, regard being paid to the relaxation of the muscles, and to bring about the co-aptation in the gentlest manner possible. Sometimes one of the ends of the fractured bone protrudes through the skin, and cannot be got back without a great deal of violence being done to the soft parts. In such a case, the projecting portion of bone should be sawn off, or the external wound enlarged so as to allow the bone to be restored to its proper situation, without any further injury to the integuments.

When the fracture is both *comminuted* and *compound*, the first indication is to remove such spiculæ of bone as are perfectly loose, detached, and near the surface, and thus a considerable source of irritation will be removed. Of course, under such circumstances, there is little chance of union by the first intention; yet, the sooner the spiculæ are removed the better, as it will put the wound into a more favorable condition for healing without the formation of abscesses.

Reduction having been accomplished, the next object is to close the wound accurately, either with strips of adhesive plaster or by covering it with lint dipped in tepid water, or in the blood flowing from the part, as recommended by Sir Astley Cooper. In a warm season of the year, the bandage may be kept wetted in a cold evaporating lotion, in order to keep down inflammation. The best plan of proceeding, if it be a compound fracture of the leg, and we in-tend to put the limb on its side in the bent posture, is to place the inferior splint with its padding and the eighteen-tailed bandage under the fibular side of the limb. Then we should effect the reduction of the fracture, and having done this, and put the limb into the right position, next dress the wound itself, and lay down the tails of the bandage. It is a great advantage to have the splint arranged under the leg before we attend to the coaptation of the fracture, for thus the limb lies steadily upon a convenient surface of support, and the rest of the necessary measures are completed without the ends of the fracture being again disturbed. It is not my intention to say, however, that this is the most eligible position for the limb, but as the practice of Pott still finds a few advocates, the exact method of putting on the apparatus adapted to this plan, has appeared to me to deserve a brief notice.

The most advantageous position for a compound fracture of the leg I find to be that in which the patient lies on his back, with the knee slightly flexed, and the limb supported on a double-inclined plane, or M'Intyre's apparatus. When the latter kind of splint is employed, it should have an excavation, or aperture, in the situation where the heel is placed, as directed by Mr. Liston, so that all hurtful pressure on this part of the limb may, with the aid of soft padding, be effectually prevented. With this apparatus, common rollers answer better than the many-tailed bandage, as they may be applied so as to include the limb and apparatus together, and at the same time to admit of those circles being taken off without the slightest disturbance of the wound or fracture which cover the place of the injury. Thus, the position of the fragments may be ascertained, the wound dressed, leeches applied, &c., in the most advantageous manner, as often as may be judged advisable.

In all leading points, the treatment of compound fractures resembles that of simple ones, with the exception of the measures called for by the wound itself; and also of those plans, which may be rendered necessary by the greater risk of inflammation, abscesses, and severe constitutional disturbance. Thus, the presence of a wound, if attended with suppuration, will make it necessary to undo the splints and bandages more frequently than would otherwise be the case. Here cleanliness is an essential point; and it is frequently advisable to put under the limb a piece of oilsilk, so as to keep the bedding from being soiled with the discharge; and, in the hot season, the parts may be bathed with a weak solution of the chloride of soda. When the discharge is profuse, it is sometimes a good plan to cover the pads themselves with oilskin; for then they can be washed every day, and kept perfectly clean with a sponge. While the inflammation is considerable, we should not put up a compound fracture too closely and tightly, because, in this state of things, the pressure of the bandages and splints will do more harm to the soft parts than good to the fracture. At the same time, I am of opinion, that those surgeons who do not put on splints at all, so long as inflammation lasts, are not the best practitioners; and that, as a general rule, the sooner splints are applied the better. Still there are many cases in which they cannot be put on tight, and a few others in which they should be dispensed with for a short time, particularly as exemplified in fractures of the elbow, attended with much inflammation and swelling of the joint.

In compound fractures of the lower extremity, a *fracture-box* is sometimes a better apparatus than common splints; for it affords great accommodation and convenience, having a foot-board whose place and position can be altered, and whose two sides can also be let down at pleasure. The bottom, sides, and foot-board of this machine are duly lined and covered with cushions. Now, when the sides are thus properly lined with soft materials, or well-contrived cushions or pads, the limb often feels much easier than with splints; and if there should be occasion to apply leeches, or any particular dressings, one of the sides may be let down, and the business accomplished without any disturbance of the limb. Sometimes both sides of the machine are let down at once: and thus the limb may be examined, and any necessary dressings applied, without subjecting the parts to any kind of motion. Before double oblique planes and M'Intyre's apparatus began to be employed, the fracture-box was even of greater importance, and more frequently used than at present. In University College Hospital it is not employed at all, because here M'Intyre's apparatus supersedes all occasion for it.

For the prevention and diminution of inflammation, we must have recourse to common antiphlogistic plans; but it is not an unusual belief, that patients with compound fractures, especially in London, will not bear venesection. Although this doctrine has been carried too far, it is nevertheless true, that if a patient were to be too much reduced by bleeding, he would not be able to bear all the profuse discharge, long confinement, and constitutional disturbance which he would have to encounter. Hence circumspection with respect to venesection is necessary; but leeches, cold applications, and aperient medicines, not urged to such an extent as to disturb the limb too frequently, should never be neglected.

When the wound does not heal by the first intention, considerable inflammation of the limb and a more or less severe attack of inflammatory fever, are likely to follow. Then, if large abscesses form, hectic symptoms will soon take the place of those characterising the first description of fever. The treatment must now be regulated by those principles which were explained in the observations on hectic fever. The sulphate of quinine and the diluted sulphuric acid should be given to check the night sweats; opium to procure rest; chalk mixture to relieve diarrhœa, and other medicines, according to particular symptoms. With respect to abscesses, a most useful part of the treatment will consist in preventing a lodgment of matter; and generally, in these cases, many abscesses form in succession; first one forms, and as soon as it is discharged, another takes place; and so the case may go on for several weeks, with a repetition of fresh inflammation and suppuration. I believe, that, in compound fractures, the discharge of pus is sometimes kept up longer than it would otherwise be, by continuing the use of relaxing applications too long. If there be reason to suspect this circumstance, we should discontinue them, and substitute for them astringent lotions, made with the sulphate of zinc or of copper. Many practitioners are partial to the plan of making pressure on the situation of the matter with compresses; but, in general, the best plan is to form an adequate outlet for it, and employ bandages directly the inflammation subsides. If there be not a sufficient outlet, I should say, that pressure cannot be of any service.

Another indication is to remove all loose portions of exfoliated bone. Some patients do not recover until long, very long, after the occurrence of the accident; and one frequent cause of the difficulty of cure, is the presence of a portion of dead bone in the part. The lodgment of a sequestrum will often retard the union of the bones for an extraordinary length of time. Hence, the dead bone should be removed as soon as practicable; and this, even though it may be more or less entangled in the callus.

With respect to the question of amputation, when hectic is present, the severity of the constitutional symptoms, and also the particular state of the fracture itself, must be considered; we are to be guided by the combined consideration of these two circumstances; and when we see that perseverence in the attempt to save the limb will most likely end in the patient's destruction, we should seize the best opportunity which circumstances afford of performing amputation.

One other circumstance it may be right to mention, namely, that many patients with bad compound fractures die, not from the bad effects of the injury of the bone itself, nor of any mischief resulting from it to the limb; but in consequence of sloughing of the soft parts over the sacrum or the trochanter, or over some other prominences of bone, where the skin particularly suffers pressure in the usual position of the patient. Such mischief is seen to arise, not only from long confinement to bed by compound fractures, but from such confinement rendered indispensable by injuries of the spine, and various tedious diseases. In these examples, there is such languor of the system, such a weakness of circulation, and diminution of nervous influence, that the parts most exposed to pressure, will frequently slough. The principles, applicable to the treatment of this kind of mortification, have been already noticed.

COMPLICATION OF FRACTURES WITH HEMORRHAGE FROM LARGE ARTERIES.

The museum of University College contains a specimen of a compound fracture of the leg, which was amputated for gangrene, that followed pressure tried for the stoppage of bleeding from one of the tibial arteries. Any considerable degree of pressure, under such circumstances, will never be endured with impunity; and, even if it could, I should say, that the plan would be inefficient in relation to the hemorrhage from vessels of this size and so deeply situated. On account of the great ill success, usually attending compound fractures of the leg, complicated with hemorrhage from one of the principal arteries, amputation has been the common practice. In fact, the broken part of the limb will neither bear pressure, nor a tedious operation for securing the artery; for, the cellular tissue is mostly gorged with blood, and if we were to pursue either of these methods, mortification would generally ensue.

All surgeons should make up their minds about the treatment of such a case, because it is an urgent one, leaving little time for consultation. If the fracture were not one requiring amputation on other accounts, I would neither have recourse to that operation in the first instance, nor to strong pressure; nor to the expedient of tying the wounded artery itself, unless it happened to be the anterior tibial in the lower and superficial part of its course, where it could be taken up without any serious additional disturbance and irritation of the injured part of the limb; but if cold applications and a gentle degree of compression failed, and there was no doubt about one of the tibial arteries being wounded, I would either try the effect of the pressure of a ring tourniquet on the femoral artery, or imitate Dupuytren, whose experience in some cases of this description demonstrated what course ought to be pursued. Thus, in one female patient, fifty-five years of age, who met with a fracture of both bones of the leg, complicated with laceration of the posterior tibial artery, he took up the femoral artery, and having thus succeeded in checking the hemorrhage, he treated the fracture by ordinary means, and the patient's life and limb were saved. In another case, a bullet had passed through the upper spongy head of the tibia, and wounded the popliteal artery. The ligature of the femoral artery was here also attended with success. Delpech adopted the same practice, and the results were equally favorable. Hence, if a fracture of the leg were not such as to require immediate amputation on other accounts, hemorrhage alone, I think, would not be a justification of it.

It is true, that here the valuable maxim of *always securing a wounded artery with two ligatures, one above, the other below the opening in it*, is deviated from; but were we to perform such an operation on the injured part of the limb itself, loaded as it is with extravasated blood, and perhaps already much swollen and inflamed, gangrene would scarcely be avoidable. There would be no difficulty in proving its ill success, by reference to several cases reported to have occurred in the London hospitals.

OF DISLOCATIONS OR LUXATIONS IN GENERAL.

When the head, or articular surface, of a bone, is thrown out of its proper place, with respect to the corresponding articular cavity, or surface, of another bone, in or upon which it is naturally situated, the accident is termed a *dislocation* or *luxation*.

In some dislocations, the head of the bone is thrown at once into the situation in which the surgeon finds it; in others, a further displacement is produced by the action of the muscles; hence, the distinctions of *primary* and *secondary dislocations*, or, as it ought rather to be expressed, of *primary* and *secondary displacements*, resulting from these accidents.

Dislocations are either *simple* or *compound; simple*, when there is no external wound penetrating the synovial membrane and communicating with the cavity of the joint; *compound*, when the injury is attended with a wound of this description.

Another difference in dislocations arises from the circumstance of their being *complete* or *incomplete;* according as the articular surfaces are entirely separated, or not. Dislocations are also divided into *old* and *recent* ones; the former not admitting, after a certain period, of successful treatment; while the latter may be generally rectified with greater facility in proportion to their recency, or the shortness of time that has transpired since their occurrence. When a dislocation arises from disease of the bones, or from elongation or any other morbid change of the ligaments of a joint, it is termed *spontaneous*.

Those dislocations of the hip, which are termed by Dupuytren *original*, or, as others would name them, *congenital*, are not the consequence either of disease or accidental violence, but of original imperfection, or malformation of the acetabulum. Dupuytren had seen about twenty-six cases in the course of twenty years; and all, excepting three or four, were in females. These congenital dislocations were first noticed by Paletta, and afterwards by Dupuytren and Deplech; and the subject has since been followed up, with reference to such dislocations of the elbow by Mr. Adams, in the ninth part of Todd's Cyclopædia; and, with reference to others of the shoulder, by R. W. Smith, in Vol. XV. of the Dublin Journal of Medical Science.

The most important differences of dislocations, depend, 1. *Upon the kind of joint in which the accident happens.*

2. *Upon the extent of the dislocation.*

3. *Upon the direction in which the bone is displaced.*

4. *Upon the length of time which the displacement has continued.*

5. *Upon the absence or presence of such a wound as makes the dislocation compound.*

6. *Upon the complication of the case with a fracture.*

7. Upon the *causes* by which the articular surfaces are separated from each other.

1. Now *with respect to the kind of joint*, we do always estimate the seriousness of the dislocation by the size of the articulation, as we do with respect to fractures, and diseases of the joints in general. In a simple dislocation, this is not always the criterion of the difficulty of reduction; and it is only when the accident is attended with a wound, communicating with the cavity of the joint, that the size of the articulation then becomes a consideration of primary importance. In fact, some dislocations of the thumb are infinitely more difficult to rectify, than luxations of the head of the thigh bone, or shoulder.

Every kind of joint is not equally liable to dislocation. In the vertebral column, if we except such dislocations as happen between the atlas and dentata, they are hardly possible. The pieces of the spine are articulated together by extensive and numerous surfaces, so diversified in their form and direction, and so powerfully bound together by ligamentous and elastic substances, that the motion between any two vertebræ, is very trivial. At all events, we cannot have dislocation without fracture except in the cervical portion of the spine. The strength of the articulations of the bones of the pelvis hardly ever yields so as to allow of the occurrence of a dislocation, or separation of the articular surfaces, unless the force applied be of that irresistible kind, which causes also at the same time a fracture of this strong and thick part of the skeleton; at once strengthened by its shape and structure, and protected by large masses of muscles arranged over a considerable portion of its exterior surface. Those joints, which are contrived for the performance of extensive and very diversified motions, are generally the most exposed to dislocations. Hence the orbicular ones furnish by far the most numerous examples of dislocations.

The ginglymoid joints perform motions resembling those of a hinge ; while the orbicular admit of motion in every direction, for which purpose the bones entering into their formation have the ball and socket construction. Their ligaments must also necessarily be loose, in order to permit this free range of motion. Hence their dislocations are more frequent than those of ginglymoid joints, which move only in two directions, and are strengthened both by their numerous ligaments and the conformation of the bones themselves. In fact, in consequence of the great breadth of the articular surfaces of several of the ginglymoid joints, the mutual correspondence of their eminences and depressions, and the number and strength of the ligaments by which they are bound together, they cannot be so easily dislocated as the orbicular ones; and, when the accident does take place, the articular surfaces are in general not wholly separated; the case being what is termed an *incomplete dislocation.*

In the orbicular joints, or those of the ball and socket kind, a dislocation is not only more frequent than in the ginglymoid ones, but it presents another difference, which is, that it is almost always *complete.*

With the exception of partial or incomplete dislocations of the astragalus from the os naviculare, two bones of the tarsus, and a rare partial displacement of the head of the humerus, we scarcely ever meet with *incomplete* luxations in any other joints, than the ginglymoid. In the ankle, knee, and elbow, however, examples of *incomplete* dislocation are common enough. For instance, in the ankle, the lower end of the tibia is sometimes partially dislocated, one portion of it continuing on the astragalus, but a larger portion of it resting upon the os naviculare.

While dislocations of the orbicular joints are generally produced by force applied to *another part* of the limb, those of the ginglymoid ones are often, but not invariably, caused by *direct violence,* applied to the joints which suffer dislocation. Hence, luxations of the hinge-like articulations are frequently attended with severe contusion, and followed by a great deal of inflammation and swelling of the soft parts, by which much obscurity in the nature of the case is sometimes occasioned, especially to a person who has not a correct knowledge of the anatomy of the particular joint that is injured.

2. *With respect to the extent of the dislocation.* The extent of the displacement, as I have said, makes the case *complete* or *incomplete;* the latter expression signifying that the particular surfaces are *partially in contact.* On this part of the subject I have little to add. Though the dislocations of orbicular joints are almost always *complete,* and those of ginglymoid ones *incomplete,* we have the exceptions which I have already specified. The head of the humerus sometimes rests upon the edge of the glenoid cavity, from which position it readily slips back again into its proper situation; and sometimes the astragalus is partially dislocated from the navicular bone. What have been described as partial dislocations of the head of the humerus, I may here take the opportunity of stating, are considered by Mr. R. W. Smith to have been in many instances congenital dislocations of the shoulder, from inperfect formation of the glenoid cavity of the scapula.*

The lower jaw is subject to what is sometimes termed a *partial* or *incomplete* luxation, in a different sense from that usually conveyed by this expression, namely, to a dislocation of one of its condyles, while the other remains in its right place.

---

* See Dublin Journ. of Med. Science, vol. xv. p. 257.

3. *Direction in which the heads of the bones are displaced.* In the orbicular joints, the head of the bone may be dislocated at any point of their circumference; and the dislocation is named accordingly *upwards*, *downwards*, *forwards* or *backwards*. In the ginglymoid joints, a dislocation may take place to either side, or backwards or forwards.

4. *The time that has transpired since the accident* makes the case, as I have explained, either a *recent* or an *old* dislocation; an important consideration with respect to the prognosis. In general, recent simple dislocations may be easily reduced; but, when the head of a bone has been out of its place several days, the reduction becomes difficult, and, in older cases, very often impossible. The muscles have now adapted themselves to the altered length of the limb and changed position of the bone, the head of the bone is fixed in its new situation, and the cavity, originally destined for its reception, becomes more or less obliterated.

5. *The absence or presence of such a wound as makes the case simple or compound.* The degree of danger is much altered by the accident being *simple* or *compound*. *Simple* dislocations, when *recent*, may generally be reduced with facility and cured without danger; but *compound* dislocations of the large joints are frequently a source of severe and extensive inflammation and suppuration of the parts, and of such constitutional disturbance as may endanger life. The degree of risk, however, will depend very much upon the *size of the joint*, the *extent* of the *laceration* in the *synovial membrane*, the *direct* and *free* or the *indirect* and *limited exposure* of the articular cavity; the *degree of contusion*, *laceration* or other mischief done to *the soft parts;* the *great* or *little* chance of healing the wound by the *first intention;* the patient's state of health, kind of constitution, and his youth or advanced age.

The same nicety of judgment is required in deciding about the attempt to save the limb in bad compound dislocations, as in bad compound fractures.

6. *Complication of dislocation with fracture.* That a dislocation must be rendered a more severe and even a dangerous accident by this complication, is self-evident. We often meet with cases of this kind in the elbow and ankle, and sometimes in the hip.*

A dislocation of the humerus, or femur, may be complicated with fracture, in consequence of a fall directly after the bone is out of its place; there may also be complication with fracture of another limb. Generally speaking, however, dislocations joined with fracture terminate favorably, except, when in addition to the fracture, the soft parts are violently contused and torn, and there is a wound rendering the accident *compound* as well as *complicated*. Even then, many cases end well.

---

* See Thornhil's case of dislocation of the femur into the ischiatic notch, with fracture, reduced after six weeks; reported in London Med. Gaz. for July 1839.

In luxations of the hip, the acetabulum may be fractured; in those of the ankle, the fibula is mostly broken; and in dislocations of the upper part of the ulna, the coronoid process of that bone is often fractured. Other complications are œdemu and paralysis of the limb from pressure of the head of the bone on the veins and absorbents, and on the axillary plexus of nerves.

7. *Causes of dislocation.* The natural *predisposing* causes are the great latitude of motion which a joint admits of; the small extent of the articular surfaces; the looseness and fewness of the ligaments; the shallowness of the articular cavity, as of the glenoid one of the scapula; the action of the muscles in particular positions of the joints; and lastly, the great length of the lever represented by the cylindrical bones of the limbs.

But, besides these natural predisposing causes, there are other circumstances, which facilitate the occurrence of these accidents, and consist of deviations from what is to be regarded as healthy and natural.

Thus *paralysis of the muscles of a joint*, and *an extraordinary looseness of the ligaments*, may become predisposing causes. Now, to understand why this state of the muscles should have the effect here mentioned, we are to recollect, that the strength of some orbicular joints depends very little either upon ligaments, or the conformation of the bones; but principally upon the support which they derive from the muscles and tendons which pass over them. This is exemplified in the shoulder. Here if we except the muscles, we find little to strengthen the joint, or hinder dislocation. The capsular ligament is too loose and yielding; the glenoid cavity too shallow to form much resistance to the displacement downwards and in some other directions. Hence, when the deltoid is affected with palsy, the mere weight of the arm will sometimes cause such a lengthening of the synovial membrane, that the head of the humerus descends two or three inches below the glenoid cavity.

Sir Astley Cooper mentions the case of a young naval officer, whose foot had been placed on a small projection of the deck of a ship, while his arm was kept extended for an hour with a rope fastened to the yard arm. Whenever this person afterwards raised his arm to his head, a dislocation was produced. The muscles of the shoulder were wasted and weakened, so that they could neither prevent the luxation, nor resist the reduction, which was perfectly easy. The same tendency to dislocation is illustrated also by Sir Astley Cooper in a case of paralysis of one side from dentition, where a young gentleman had the power of throwing the head of the humerus over the posterior edge of the glenoid cavity, but it could be most easily replaced again.

When the ligaments are preternaturally loose, dislocations will arise from very slight causes. Hence, some persons cannot yawn, or laugh, without the risk of a dislocation of the jaw. Sir Astley Cooper speaks of a young girl, brought up to tumbling, whose patella used to be brought flat against the outside of the external condyle, whenever the rectus muscle was put in action. Collections of fluid in the knee, by causing an elongation of the ligaments of the patella, give a tendency to dislocation of that bone. Whenever a bone has once been dislocated, the production of the displacement again is more readily effected, than in the first instance.

Such diseases as destroy the cartilages, ligaments, and more or less of the articular surfaces, often cause dislocations, which, as I have stated, then receive the name of *spontaneous* or *consecutive ones*. We meet with them frequently in the hip, and sometimes in the knee. There used to be a specimen in the museum at St. Thomas's, in which the bones of the leg were so displaced from the knee by disease, that the leg formed a right angle, directly forwards from the condyles of the femur. I have also seen the head of the tibia drawn quite up into the ham from disease of the knee-joint; also another case in which the tibia could be moved, and this even when the limb was extended, very far towards either side. Bones are sometimes dislocated by the effects of the growth and pressure of tumors on the ligaments, and parts of the articular surfaces; also, by the contraction of burnt parts, of which there is a remarkable example described by Cruveilhier, where the carpus was thus displaced from the radius. The change in the shape of the bones, produced by rickets, will sometimes cause a dislocation. The clavicle has been dislocated inwards at its sternal end, in consequence of disease and deformity of the spine. Dislocations, however, are most commonly occasioned by external violence.

In the ginglymoid joints a dislocation is usually produced altogether by external violence; but, in the enarthrosis, or orbicular joints, the action of the muscles may have a share in promoting the accident. We have one ginglymoid joint however, in which a dislocation is commonly the result of the action of muscles, viz. the articulation of the lower jaw.

When a person falls on his elbow, while the arm is separated from the side, the force thus applied tends to throw the head of the humerus down into the axilla; but the dislocation is much promoted by the action of the pectoralis major, teres major, and latissimus dorsi, which, during the alarm, contract, and pull the head of the bone downwards, and inwards.

When the articular surfaces are in particular positions, with respect to each other, a dislocation may arise entirely from the action of the muscles, as is exemplified in the jaw, also in the enarthrosis joints, when the axis of the bone is oblique, with respect to the surface, with which it is articulated.

With respect to the injury done to the parts about dislocated joints, such ligaments are torn as naturally keep the heads of the bones from being thrown in the particular directions, in which we find them displaced in the various examples of the accident. Even tendons in the vicinity of the joint are frequently lacerated. The capsular ligament and synovial membrane are torn; in the hip the ligamentum teres is ruptured; in the shoulder the tendon of the biceps is occasionally, but not generally, broken; Sir A. Cooper in his dissections never having noticed it. When the head of the bone is thrown into the axilla, the tendon of the subscapularis is ruptured. Even the muscles themselves are sometimes lacerated, as the pectineus, and adductor brevis in luxations of the thigh: and while some muscles are stretched, others are shortened. From this account, it must be manifest, that a dislocation in its most simple form is rather a complicated injury.

General symptoms of dislocation. Pain in the joint, and great difficulty or absolute impossibility of moving it. These are *equivocal*, belonging to other cases as a bruise, a fracture, or a sprain.

We may say, however, that the symptoms generally consist of an interruption of the functions of the joint. The head of the bone can often be felt in an unnatural situation, and amongst parts which it compresses and renders painful. Hence, there is a diminution or loss of motion in the joint, the limb or part is either shortened, lengthened, or distorted, according to the kind of dislocation. When there is an elongation of the limb, it removes all suspicion of fracture, and this view is confirmed by the circumstance of there being no crepitus. The axis of the dislocated bone is changed, the shape of the joint is altered, the natural prominences of bone either disappear or become less conspicuous, as the trochanter does in dislocations of the hip, or the reverse may occur, as is the case with the olecranon in dislocations of the elbow, and the acromion in dislocations of the shoulder, these processes projecting more than usual. In many cases the head of the bone may be plainly felt in its new situation, and then the nature of the accident is readily detected by rotating the limb, as the head of the bone then also rotates.

The pressure of the head of the bone on the surrounding parts causes severe pain, which is much increased when the limb is moved. When a large nerve is thus compressed and injured, an obstinate, and even an incurable palsy may be the result. Nay, the pressure of a dislocated bone upon important organs may endanger life, as has happened from the pressure of the dislocated sternal end of the clavicle upon the œsophagus.

In subjects who are not too fat, and in whom inflammation and swelling have not had time to come on, the head of the dislocated bone may sometimes be distinctly felt, forming a preternatural tumor or projection; while, in the situation of the articular surface, there is an unusual depression or want of fulness.

A dislocated bone cannot be so easily moved about as a fractured one, yet, for a short time after the accident, a considerable degree of mobility sometimes remains. In one case, the head of the thigh bone was thrown upon the obturator foramen, the femur could at first be moved about with freedom; but, in less than three hours, the head of the bone became firmly fixed by the contraction of the muscles.

Dislocations are generally followed by swelling, which comes on quickly and to a considerable extent, when the violence has been great—the joint is a ginglymoid one—and blood extravasated. Such swelling often conceals the displacement of the bones and hides the change in the relative situation of certain processes of bone, so that it becomes less easy to make out the nature of the accident.

In simple dislocations which have been reduced, the ensuing inflammation rarely terminates in suppuration, though two fatal instances of it, after the reduction of dislocations of the hip, are recorded by Sir Astley Cooper.

The *prognosis* depends upon several considerations. The increased trouble and danger of compound and complicated dislocations I have already mentioned. Old luxations can hardly be reduced after a certain time, for not only the muscles become permanently shortened, and the articular cavity more or less obliterated, but the head of the dislocated bone acquires adhesions to the parts in its new situation, and is sometimes confined by a new bony socket, which must be broken ere the head of the bone can change its situation again.

When a dislocation of an orbicular joint is left unreduced, nature will sometimes make vast efforts to restore to the limb some degree of the power which it has lost. She does this occasionally by forming a kind of new joint, and, as I have said, even sometimes a new socket, for the displaced head of the bone. In the generality of cases, if the head suffer pressure, it undergoes a change in its shape, and becomes lessened. New ligaments are sometimes produced, calculated for holding the head of the bone in the best situation which circumstances will allow, with a view to the restoration of some use in the limb. Thus, when the head of the humerus has continued long unreduced, the cup of the scapula becomes filled up, a new cavity may be formed on the concave surface of the scapula for the head of the humerus, and new ligaments produced, adapted to this substitute for the original joint.

In the hip, a new cavity is sometimes formed for the head of the femur near the anterior and superior spinous process of the ilium, or the head of the bone may lie upon the dorsum of the ilium, or upon the foramen ovale, and there have a new kind of joint with a socket and ligaments produced around it.

In the ginglymoid joints, however, nature has much less power of lessening the evils of a neglected and unreduced dislocation. the shape and breadth of the articular surfaces readily explain why this should be the case. Circumstances are very different from those of an enarthrosis joint; where the displaced head of the bone is more or less globular, a configuration which qualifies it admirably for motion in every direction. In fact, in the ginglymoid joints, the dislocations of which we know are generally incomplete, the neglect to reduce the displacement is often followed by anchylosis. By referring, however, to Cruveilhier's great work on Pathological Anatomy, we may find cases and engravings illustrative of the efforts which nature sometimes makes, even in an unreduced dislocation of the elbow, to form new articular cavities for the displaced ends of the humerus and radius. Many years ago, I saw a case, in which a lad about sixteen years of age dislocated the upper head of the ulna into the place of the radius, so as to displace the head of the latter bone from the lesser articular surface of the humerus. The accident had not happened more than between three and four weeks, yet two of the late surgeons of St. Bartholomew's, namely, Mr. Abernethy and Mr. Ramsden, with every means they could devise, were not able to reduce the ulna into its right place again.

Notwithstanding the partial improvement in the state of the limb, accomplished by nature, in unreduced luxations of the ball and socket joints, it may be observed generally, that she can never of herself rectify these accidents; and the patient, if his case be mistaken or neglected, will be forever afterwards a cripple—a monument of surgical ignorance—the disgrace of the practitioner originally consulted.

With respect to the question, what ought to be done for old unreduced dislocations? the answer is, that *after a certain time nothing can be done.* Attempts to reduce the shoulder after it has been dislocated three months have rarely succeeded in this country; and if conducted with too much violence, they may cause serious mischief, rupture of the axillary artery, paralysis from injury of the axillary plexus of nerves, laceration of the soft parts, gangrene, and death. If the head of the bone should have formed an accidental connexion with the axillary artery, the rupture of this vessel may happen in the attempts to reduce the bone, is exemplified in two cases under Professor Gibson.*

On the other hand, Baron Dupuytren, some time ago, had reduced twenty-three dislocation of the hip and shoulder, which had remained unreduced from fifteen to eighty-two days. In all old cases, if an attempt is to be made to reduce the bone, the patient's muscles should be first weakened by means of the warm bath and bleeding; plans which Dupuytren always practised. As for the emollient and oily applications to the parts, employed by Dupuytren, I cannot suppose that they could have had any real effect on the nature of the resistances which were encountered. Pulleys were not employed, but gradual extension was made by the assistants, while the patient was engaged, as much as possible, by conversation, and his mind diverted from the case.

---

* See Gibson's Institutes of Surgery, vol, i. p. 324. ed. 5. Philadelphia, 1838.

The dislocations, named by Dupuytren *original*, or *congenital*, depending upon the imperfect formation of the acetabulum, are of course incurable. The same remark applies to other congenital dislocations.

TREATMENT OF DISLOCATIONS.

1. The first indication is *to reduce*, or *replace the head of the bone*, or *articular surface* that has been removed from its natural situation.

2. The second is to *prevent all movements of the limb, or part likely to bring on a return of the displacement, or a disturbance of the torn synovial membrane, ligaments, muscles, and tendons.*

3. The third is to *endeavor to render the inflammation* following the accident as moderate as possible.

1. *Reduction.* In order to be able to judge of the principles by which we should be guided in the fulfilment of this first indication, we should consider what are the resistances likely to be encountered.

The chief impediment to the reduction generally arises from the resistance of the muscles, and becomes greater and greater in proportion to the length of time which the bone remains unreduced. The business of the surgeon is to counteract this resistance. If the attempt at reduction be made immediately after the accident, the resistance of the muscles is then more easily overcome than afterwards; and, very often, if the operation be deferred for only a few days, the utmost difficulty is experienced.

That the action of the muscles forms the principal impediment to reduction is proved, first, by the *facility of replacing the head of a dislocated bone when the muscles are paralytic:* secondly, by the same facility which occurs *when the patient happens to faint*, or *to be debilitated by bleeding*, *sickness*, *intoxication*, or any other cause.

Another proof of the muscles being the powers resisting the surgeon's endeavors to reduce the bone, is the ease with which a luxation may often be reduced when the attempt is suddenly made *while the patient's mind is directed to another subject*, and the muscles are unprepared for resistance. These facts furnish useful suggestions in practice; teaching us, not only how to avail ourselves of any accidental swoon, or syncope, as an advantageous moment for the reduction; but also, how, in cases attended with difficulty, to adopt means for the express purpose of inducing faintness, great temporary debility, and universal muscular relaxation. The means alluded to are *bleeding from a large orifice*, *nauseating doses of the tartrate of antimony*, the *warm bath*, and the exhibition of *opium*.

I do not mean, however, that such means should be employed in every case of dislocation;—certainly not; only in those where great resistance is to be overcome owing to the strength of the muscles, or to the time the bone has been out of its place.

The reduction of a dislocated bone requires, of course, the employment of mechanical force in some way or another, to bring the head of such bone back into its proper situation again.

It is chiefly the orbicular joints, whose dislocations are liable to the *primary* and *secondary* displacement already referred to. The luxations of ginglymoid joints are generally incomplete; and no secondary displacement from muscular action usually follows the first immediately occasioned by the violence itself.

In fulfilling the first indication, we are to consider what *course the head of the bone has taken to reach its present situation*, *and make it return*, *as nearly as possible*, *by the same track*. If it be the upper head of the humerus, or of the thigh-bone, that is dislocated, and it should appear to have undergone secondary displacement, by the action of the muscles, we are then to direct our first interference to the removal of this secondary displacement. In short, extension is first to be made for the purpose of dislodging the head of the bone from the situation into which it has been retracted by the muscles. It is therefore generally made in the direction, which the dislocated bone has assumed. Now, in many cases, no sooner has this been done, and the head of the bone been a little inclined towards its articular cavity, by giving the bone a particular direction, than it is drawn into its place again by the muscles themselves, a snap being heard at the moment of its gliding into the socket.

If, however, we were merely to make extension, we should not generally reduce the dislocation, but pull the patient off his chair or bed. The *extension* must therefore be accompanied with some plan for fixing the bone or bones with which the luxated one is naturally connected: it must be combined with *counter-extension*. In the reduction of dislocations of the hip and shoulder, *counter-extension* is usually made by means of a girth, or sheet, with which the pelvis or chest is fixed. The girth, or sheet, may be held by the assistants, or be fixed to a post, or iron ring screwed into the wall, or floor.

On the Continent, many surgeons *apply both the extension and counter-extension*, *as far from the dislocated joint as they can*. In dislocations of the hip, they make extension at the ankle, and counter-extension by fixing the pelvis; in dislocations of the shoulder, they make extension at the wrist, and counter-extension by fixing the scapula and chest. In dislocations of the forearm, instead of making counter-extension at the humerus, as is done in England, Baron Dupuytren makes it by fixing the chest and shoulder just as we do for the reduction of the head of a dislocated humerus. The necessity of fixing the scapula and chest in dislocations of the shoulder, and pelvis in dislocations of the hip, is so obvious as to require no comment.

In this country, in compliance with Pott's advice, *extension* is most commonly made by applying the force to the lower part of the dislocated bone itself, and *counter-extension* by fixing or applying the counter-extending force to the bone or part with which the dislocated one is naturally articulated. In dislocations of the shoulder and hip, the French plan affords the advantage of a longer lever, whereby additional power is gained, not merely in the extension itself, but at the important period when, by making use of such a lever, as a means of inclining the head of the bone towards its socket, we give the muscles the opportunity of drawing it back into its right place again.

The principle *of using the dislocated bone*, or *even the whole limb*, *as a kind of lever* for the accomplishment of the reduction, is one of the highest importance, perhaps of as much practical utility as *that of relaxing the muscles* concerned in making the greatest resistance to the completion of this first indication.

In certain dislocations, the reduction cannot be accomplished merely by *extension* and *counter-extension*. When the head of the thigh-bone is thrown upon the obturator foramen, these means are useful when carried to a moderate extent; or, in other words, when practised just so far as to dislodge the head of the bone from that situation; but the limb not being shortened, nor the bone truly retracted, further extension will do no good. The object is now to incline the head of the bone outwards towards the acetabulum, by carrying the knee and leg inwards; while a kind of fulcrum for the lever, which the femur now represents, is sometimes formed by placing a band or piece of cloth upon the inside of the thigh a little way below the groin, and drawing it outwards at the moment that the lower part of the bone and limb is moved inwards.

This *principle of using the dislocated bone as a lever* for the reduction of its displaced head, or articular surface, is illustrated in the treatment not only of luxations of the hip, but in those of the shoulder, jaw, and other parts.

In the hip, indeed, it is necessary on another account, viz. the acetabulum is surrounded by a high ridge, which makes it necessary that the head of the bone should be lifted over it. Nothing has a greater effect in facilitating the reduction, than attention to this principle.

The *relaxation of the muscles* was insisted upon by Pott as much in the treatment of dislocations as in that of fractures, and when it can be practised with due attention to other principles, it cannot be too much commended; but, in the reduction of some dislocations, the position of the limb must occasionally be regulated by other considerations, as, for instance, *the advantage of making the first extension in the direction calculated to remove the secondary displacement;* in other words, for dislodging the head of the bone from the situation into which it has been drawn by the muscles subsequently to its first displacement. Neither is the *advantage of the lever* to be sacrificed altogether to the plan of relaxing the most powerful muscles.

In a dislocation of the lower end of the tibia from the astragalus, relaxing the powerful muscles of the calf of the leg has very great effect in facilitating the reduction.

The extending force may be made either with towels, sheets, a table-cloth, or any other piece of strong linen, folded and applied round the limb, and drawn by assistants, or else with a multiplied pulley; while the counter-extension is made with a girth or cloth, by which the shoulder or pelvis is fixed.

In dislocations of ginglymoid joints, however, it is seldom requisite to use any folded sheets or cloths either for the extension or the counter-extension, as both can be effectually performed with the hands of the surgeon and his assistants.

In France it is customary, for the purpose of preventing the soft parts from being chafed and hurt by the pressure of the extending means, to cover the part of the limb to which they are applied with a piece of linen smeared with ointment. In this country, we frequently apply a wet roller round the part, which not only protects the skin, but will not slip, like any greasy application. Flannel or buskin has likewise been occasionally employed.

It is a rule always to let the extension be made unremittingly and increased very gradually. Sudden violent efforts will be resisted by the muscles, and are more likely to cause laceration of the soft parts than the return of the bone into its place. Moderate extension, slowly increased and incessantly maintained, will soon tire the strongest muscles.

When the resisting muscles are very powerful, or there is additional difficulty on account of the length of time which the dislocation has continued, we may let the attempts at reduction be preceded by means calculated to bring on temporary weakness or fainting.

The *return of the bone into its right place* is indicated by the snap heard at the instant of its slipping into the socket, by the restoration of the proper shape of the joint, and by the recovery of its original motions. No snap is audible, however, if the patient be very faint, or weakened by intoxication; for then the muscles do not generally act with sufficient vigor to occasion a sudden return of the bone into its socket. That part of the process of reduction, which consists in putting the head of the bone in its place, is termed *coaptation*. In the orbicular joints, when extension and counter-extension are made, the muscles sometimes replace the head of the bone by their own action, without the surgeon troubling himself much about coaptation; but, in dislocations of the ginglymoid joints, the coaptation, or pressure of the head of the bone towards its right place, is frequently even more essential than extension and counter-extension, of which a very moderate degree is sufficient.

2. The second indication is *to prevent all movements of the part or limb likely to produce disturbance of it, or to bring on a return of the displacement*. The rupture of the ligaments, and sometimes of tendons, which naturally strengthen the joint, render this precaution necessary.

The reduction having been accomplished, our next object is to confine the part or limb in a posture in which the luxation cannot return. For instance, the head of the thigh-bone cannot be thrown out of the acetabulum while the limb is in the state of adduction, with the knee close to its fellow. Hence, after the reduction of such a dislocation, the knees are to be confined together with a slack roller. The shoulder cannot be dislocated while the humerus is kept near the side: after the reduction, therefore, we confine the elbow in that posture with a sling, aided sometimes by a roller. The lower jaw cannot be dislocated unless the mouth be widely opened. After the replacement of the condyles, therefore, we put on the four-tailed bandage, by means of which we keep the bone quiet, and hinder the mouth from being opened.

This prevention of motion of the dislocated bone, and confinement of it for a few days in a particular position, determined on the foregoing principle, are also useful in promoting the union of the torn ligaments, tendons, and musules. It is one of the best things likewise with the view of preventing the inflammation from attaining a severe degree.

The *third indication*, or *the prevention and removal of the inflammation and its effects*, sometimes requires, besides quietude of the part, other antiphlogistic means, such as cold evaporating lotions, leeches, and purgative medicines, and, in severe cases, venesection, fomentations, and poultices. One might expect, that the consequences of the inflammation would be more serious after a dislocation, where ligaments, muscles, and tendons, are actually torn, than after sprains, where they are only violently stretched. But experience proves the contrary, and that, if the reduction be skilfully performed, the inflammation and swelling commonly subside in the most favorable manner.

COMPOUND DISLOCATIONS.

Here the severity and danger depend upon various circumstances:—

1. The size of the joint.
2. The extent of the laceration in the synovial membrane, and of the injury of the ligaments and tendons.
3. The degree of contusion and laceration in the soft parts.
4. Several complications, as fracture and comminution of the bone, rupture of large blood-vessels, considerable effusion of blood in the cellular tissue, paralysis, &c., bad health, extreme old age, and general debility.

The ankle-joint is perhaps more exposed to compound dislocations, than any other joint in the body, which are also, for the most part, complicated with a fracture of the fibula. Compound dislocations of the thumb are remarked to be followed by tetanus with extradordinary frequency; and hence some writers, but not good practitioners, as I suspect, advise, in these cases, amputation, as a preventive of that fatal disorder.

Compound dislocations are to be treated very much on the same principles as compound fractures. The first thing for decision is, whether the circumstances of the accident justify the attempt to save the limb.

If the joint be the knee, the laceration in the capsular ligament extensive, several other ligaments torn, and the integuments and soft parts considerably injured, amputation should be performed without delay.

In compound dislocations of the elbow, wrist, and ankle, amputation is less frequently performed at the present day than formerly. After the reduction, appearances are much changed for the better; and these accidents, unless accompanied by an extraordinary degree of laceration and contusion of the soft parts, and complicated also with fracture, generally terminate well.

When an attempt is made to save the limb, the bone or bones are first to be reduced. The next object is to heal the wound, if possible, by the first intention, so as to convert the case, as it were, from a compound into a simple dislocation.

If the head of the bone should protrude, and much difficulty be experienced in the reduction, some practitioners would adopt the plan of sawing it off; but, if it can be returned into its proper place again, this seems to me to be the best practice. The cases published by Mr. Hey of Leeds, are certainly but little in support of the other suggestion, though intended to convey the most favorable view of it. The edges of the wound, having been brought together with sticking plaster, the joint may be covered with linen, wet with a cold evaporating lotion, and kept steady and motionless by means of splints duly applied, and lined with soft pads.

In the early stage, venesection, leeches, purging, low diet, and other antiphlogistic means will be requisite.

At present, limbs are not so frequently amputated for compound dislocations as they used to be thirty or forty years ago; the right principles of treatment being now better understood. Cases, which have an alarming appearance, while the bones protrude, and the external wound is unclosed, look very differently after the reduction of the bones, and the dressing of the wound.

However, examples do occur, in which the propriety of amputation is unquestionable, and it must be judged of by reference to some of the considerations already mentioned.

When from the first no chance presents itself of ultimately saving the limb, the knife should be employed without delay. If we lose time, we only give an opportunity for inflammation, suppuration, and even gangrene to arise, attended with such disturbance of the whole constitution as may neither admit of being controlled, nor afford another period sufficiently tranquil for the successful performance of the operation. All the considerations already specified in this work, with regard to severe gunshot-wounds of the limbs, and the worst kinds of compound fractures, are equally applicable to bad compound dislocations.

CONTUSIONS.

A *contusion* or *bruise* is a mechanical injury of the soft parts, produced by the blow of some obtuse body or weapon, or the collision of a hard blunt substance against them, without, however, any breach taking place in the integuments, which, technically speaking, would make the accident rank as a *contused wound*, and not a simple bruise. A contusion varies in degree, from a very trivial injury of the parts which have received the blow, to their complete disorganisation, as exemplified in those dreadful forms of mechanical violence, erroneously termed *wind contusions*. In all severe contusions, besides the sudden forcible compression of the parts, besides the inflammation necessarily following the injury of the various textures, there is a rupture of an infinite number of minute blood-vessels, and the knowledge of this fact will account for the rapidity with which the swelling frequently comes on. It also explains to us the cause of the black and blue, or livid, discoloration following ordinary bruises, and well known amongst surgeons under the name of *ecchymosis*. Of this effect of contusion, what is called a *black eye* is a familiar example. An ecchymosis depends then upon the escape of blood from the minute vessels into the cellular tissue. Numerous small arteries and veins are burst by the violence of the blow, and blood and serum are immediately effused into this texture. However, the reason of the various shades of red, purple, green, and yellow, which present themselves in the different degrees and periods of an ecchymosis, is not entirely ascribable to the extravasation of blood, but to other changes, the nature of which has, perhaps, not been made out. Dr. Macartney's explanation of it is, that the absorbents first take up the coloring matter; and hence, says he, the color of bruised parts is, in the beginning, a dark purple, or black color, because the effused blood soon acquires the venous character, and, as the coloring matter is absorbed, the part becomes yellow.

When the skin is unbroken, the extravasated blood may accumulate in considerable quantity; and it is a remark made by Dr. Macartney, that, unless it be wanted for reparation, as in fractures, it usually does not coagulate, and is removed by the absorbents.

Contusions sometimes produce the rupture of more considerable vessels, and then the hemorrhage, in particular situations, may have fatal consequences. Thus, when a contusion of the head occasions the rupture of one of the arteries of the brain, or of the dura mater, the pressure of the effused blood upon that important organ will give rise to the most urgent danger. Here the peril is not from the quantity of blood abstracted from the circulation, but from its pressure on a certain part, whose functions cannot bear it without life being endangered. In other instances, however, we find enormous collections of blood, vast extravasations arising from contusions, but not attended with any serious degree of danger, though productive of an immense degree of swelling, and much disfigurement. Thus, a contusion of the head, instead of rupturing one of the arteries of the brain, or dura mater, may only burst a considerable arterial branch under the scalp. In this circumstance, the scalp will sometimes be raised up from the skull several inches; and were the degree of danger to be estimated by the degree of swelling and deformity, a very erroneous prognosis might be delivered. In fact, experience proves, that most of these collections of blood in the cellular tissue from contusions admit of being dispersed by proper treatment, and this generally without making any opening for the discharge of such blood. The absorbents are for the most part competent to bring about its removal.

The severity of a contusion depends, not simply upon the violence with which it is occasioned, but upon the nature of the parts affected by it. Thus contusions of the skull, on account of the mischief, likely to be produced by them within the head, are always perilous accidents. A contusion on the hypogastric region, at a period when the bladder is distended with urine, will easily rupture that organ; a contusion on the abdomen, when the bowels are distended, will sometimes burst them, and cause a fatal effusion of their contents in the cavity of the peritonæum. A contusion of the integuments, situated directly over the hard surface of a bone, will often cause them to slough, whereas similar violence applied to the skin, not so situated, would not lead to equal mischief.

Contusions are sometimes dangerous, from the effect they have on parts more or less remote from those on which the violence has immediately acted. This effect is termed by the French a *contre-coup:* Pott mentions an illustration of it in a man, who fell with great force on the tuberosities of the ischium without striking any other part of the body; yet the result was a concussion of the brain.

In the treatment of contusions, the *first indication* is to *prevent and diminish the inflammation* likely to follow the accident. For this purpose, rest, fomentations, or cold evaporating lotions, and, in severe cases, venesection, purgative medicines, leeches, and antiphlogistic treatment in general are proper. Bruised muscles are to be relaxed. Cold applications have a useful effect in checking the further effusion of blood into the cellular tissue.

The *second indication* is to *promote the absorption of the extravasated blood and serum* by employing (after the tendency to inflammation has subsided) means calculated to quicken the action of the absorbent vessels; lotions containing hydrochlorate of ammonia, diluted acetic acid, and camphorated spirit of wine; and, when the case is chronic, camphorated liniments, and the pressure of bandages.

The third indication is to restore the tone of the parts, and remove any disposition to œdema. This object requires more stimulating liniments, containing iodine or iodide, of potass, or a good proportion of camphor or ammonia; pumping cold water on the parts, champooing, passive motion, and a bandage.

When, notwithstanding the means here recommended, the absorbents appear incapable of dispersing the swelling caused by a copious effusion of blood, and matter forms, it becomes indispensable to make an opening, remove as much of the blood as possible, and treat the case like a common abscess.

SPRAINS.

When a joint is forcibly moved, or twisted, in any direction further than the natural conformation of the bones and arrangement of the ligaments will properly allow, yet without the degree of displacement amounting to a dislocation, the accident is termed a *sprain*. In every sprain, then, the ligaments are violently stretched, and no doubt, sometimes, partially torn. This is not, however, all the mischief attending such an accident. The violent wrench, or twist of the joint, extends its action to all the surrounding soft parts; the tendons and their thecæ, the integuments, and even the muscles themselves, through the medium of their tendons. All these parts are sometimes stretched with a degree of violence, that must involve them in the consequences. The ginglymoid joints chiefly suffer from sprains, especially the ankle, the wrist, and articulations of the fingers and thumbs. A ginglymoid joint is more liable to a sprain than an orbicular one, because its movements are naturally very much restricted to two directions, so that any accidental twist, or forced movement of it in another direction, cannot happen without the ill consequences being produced to which I have adverted. If it could move in every direction, like an orbicular, or ball and socket joint, then it would suffer a sprain only when the movement were forced in any direction beyond a certain point; but the movement, if not carried too far, might be made in any direction without mischief. The observation, that an orbicular joint cannot be sprained, does not appear to be altogether correct; for the shoulder is sometimes sprained by the arm being carried too far behind the trunk, and, as Sanson remarks, the hip may be sprained by the extreme abduction of the femur. As for the general symptoms of a sprain, they consist of pain, faintness, or even sickness, inability to use the joint, more or less swelling, and a degree of ecchymosis. The effects of sprains in elderly persons are often tedious, disabling such persons for weeks and months. These accidents, indeed, frequently require a longer time to be cured, than the complicated injury left in the textures about a joint after the reduction of a dislocation.

The first indication is to keep the sprained joint perfectly quiet, and adopt measures to prevent inflammation. At first, we may apply cold evaporating lotions, or fomentations, and have recourse to leeches, purgatives, and in severe cases of venesection. Fomentations often give more relief than cold applications.

When all disposition to inflammation is past, and merely a degree of stiffness, and a tendency to œdema remain, the *second indication* is to aim at the removal of these consequences, by means of liniments, bandages, the pumping of cold water, on the joint, straps of soap and adhesive plaster applied circularly and perpendicularly in an alternate manner, so as to form an efficient support for the joint and neighboring parts, champooing, &c. In scrofulous persons, sprains frequently lead to disease of the joints; and whenever there is reason to suspect, from the tediousness of the case and the general appearance of the patient, that any danger of this kind is present, the part ought to be blistered without further delay.

[Sprains, or sub-luxations, as they are technically termed, are accidents which occur most frequently at the ankle joints, especially in females. In persons of the phlegmatic temperament, especially if their circumstances are such, that they are not obliged to use the limb, the consequences are often exceedingly tedious; sometimes, indeed, the use of the limb is never wholly restored. We were recently consulted, in the case of a young lady, who had been thus suffering for eight years, during most of which time she had been unable to walk.

In such cases as the above, the patients become nervous, and fancy themselves helpless, the temperament of the foot and leg is diminished, and the muscles become flabby and atrophied. Such cases are often regarded as inflammatory, and treated by bleeding, counter-irritation, and other antiphlogistic remedies, all of which tend to increase the existing difficulty. These also are in part the cases, in which that class of men, called natural bone-setters, are so successful. By their manipulations, friction, torsion, and exercise of the limb, they excite the nervous energy of the part; and by obliging the patients to exercise, by degrees, a permanent cure is established.

The pathology, in these cases of long standing, is generally a loss of tone in the nerves of the part, and, of course, the indication is, to make use of such remedies as will excite these organs to a due performance of their natural duties; such as the warm douche, friction, and exercise; this last is indispensable. After a while, the cold douche will be preferable. In these cases, when the patient begins to exercise the joint, there is considerable pain and swelling in the part. Now, we may lay it down as a rule, that if this pain do not continue longer than from twenty to twenty-four hours, the exercise should be persisted in; but if the pain continue more than twenty-four hours, the amount of exercise should be diminished. In many of these cases, electricity is of great service.—Ed.]

DISEASES OF THE BLOOD-VESSELS.

The diseases of arteries and veins constitute one of the most interesting departments of surgery. In the remarks on hemorrhage, and on the principles which should guide us in the choice of means for its stoppage, I have indeed already touched upon the subject; but various parts of it still remain to be explained.

1. *Diseases of arteries.* The participation of arteries in the general organisation of all other living parts of the body must render them susceptible of *inflammation*, *suppuration*, *ulceration*, and *sphacelus*. They are also liable to a *deposit of earthy matter between their internal and middle coats; to a steatomatous thickening; to dilatation; to obliteration;* and to several other deviations from their healthy condition.

The two great arterial trunks, the aorta and pulmonary artery, differ remarkably in two respects. The branches of the aorta unite and anastomose freely with other branches derived from that vessel or its continuations; but the branches of the pulmonary artery remain separate and unconnected from their origin to their very termination. A thin transparent pellicle is found to line the interior of a large aortic artery. Externally this is a dense hard brittle tissue, which can be separated only in scales, forming in reality a distinct tunic composed of several layers, situated between the fibrous and serous coats. This structure, which Malgaigne has named the *sclerous* coat, is that which renders the aortic branches stronger than those of the pulmonary artery; so that if branches of equal diameter be cut through, that from the aorta will present an almost circular opening, while that from the pulmonary artery will be evidently collapsed. When any species of concretion, or any point of ossification, occurs in the aorta, it is almost always in this tunic; and it is remarkable that, in the pulmonary artery, where this coat is not found, no well-attested case of ossification is on record.

The coats of the aorta are often the seat of disease, and the branches arising from many of the trunks which it gives off frequently wounded; while those of the pulmonary artery rarely undergo any morbid change, are seldom wounded, and, when they are so, admit of little being done. Hence, with reference to surgery, the aortic system of arteries is by far the most interesting.

The *internal coat of an artery is more subject to inflammation*, than either its middle or its external coat. This is proved by the frequent and copious effusion of lymph upon the inner surface of an artery, in consequence of the inflammation of contiguous parts, the application of a ligature, the effect of a wound, the pressure of tumors, or any irritation in the vicinity of the artery affected. Sometimes the inflammation thus excited spreads to a great distance from the point at which it commences, even up to the heart itself. Such a case receives the name of *arteritis;* a formidable complaint, rapidly producing great irritative fever, an extremely quick pulse, collapse, low delirium, and generally death.

Chronic inflammation of the arteries is frequently met with, especially as a cause or effect of calcerous deposit. An appearance, similar to that produced by inflammation, often presents itself upon the internal surface of arteries; viz. a *vivid redness* or *scarlet tinge.* This is not, however, always the result of inflammation; for it may not be accompanied by an effusion of fibrine, or any thickening of the vessel. Arteries exposed in the dissecting room to the air for a few days, and in which a degree of putrefaction has taken place, invariably assume the same color.

Although large arteries resist *ulceration* for a long while, they are sometimes involved in it. When healthy, and not placed under circumstances peculiarly unfavorable to their own nutrition, they seem to be capable of resisting its destructive effects more powerfully, than when their external surface has been separated from its surrounding connections, or their coats are the seats of previous morbid alterations.

Considerable arteries not only pervade the generality of diseased structures for a long while without being attacked by ulceration, but preserve themselves in the midst of the worst tubercular and cancerous affections. This indisposition of arteries to suffer from the ravages of surrounding diseases, is strikingly illustrated in the extensive cavities sometimes formed towards the roots of the lungs in tubercular phthisis; all those fræna or bands, extending across such cavities, being only arterial branches, which have escaped the work of disorganisation. Sometimes, however, the arteries are attacked by ulceration, in consequence of certain forms of disease around them. We know that this frequently happens in phagedenic ulceration, cancer, and hospital gangrene.

The internal coats of the arteries may also be attacked by ulceration, primarily beginning in it. The ulcerations are generally of roundish shape; sometimes only one exists in the whole arterial system; sometimes the aorta is studded with them. In proof of the arteries being liable to *suppuration*, I may mention that Andral once found the lining of the aorta raised up by six abscesses, each of which was as large as a nut, and situated between the internal and middle coats. Pus is also occasionally noticed within certain arteries, either blended within the blood, or contained alone within the vessels. The same pathologist has seen most of the branches of the pulmonary artery in this remarkable condition.

Pus is not, however, so often found between the internal and middle coats of arteries, as a peculiar matter, that is not precisely like any other production in the animal economy, and has long been described under the name of a *pultaceous* or an *atheromatous substance.* Blended with it, are frequently noticed particles of earthy matter, which feel like sand. When they are abundant, they form, within the texture of the vessel, a sort of *concretions more like mortar* in their appearance than bony formations. These *calcareous deposits* are so common in elderly persons, that they are calculated to exist in seven tenths of all individuals whose ages exceed sixty. This was the observation of Bichat, which agrees with that of Dr. Baillie, who represents the change as being more frequently seen in old persons, than the natural or perfect state of the arteries.

However, young subjects are not completely exempt from such ossifications. The temporal artery has been found ossified in a child only fifteen months old; and the late Mr. Wilson met with an ossification of the aorta in a subject aged only three years. In one girl, eight years old, and in four or five other young persons between eighteen and twenty-four years of age, Andral saw the aorta studded with calcereous deposits; and in another person under forty, there was a considerable ossification of the superior mesenteric artery.

Strictly speaking, the *internal coat is never the seat of these earthy deposits*, though it is frequently raised up by them, thinned, and even cracked, or more or less absorbed, so that they are then actually in immediate contact with the blood itself.

While these earthy deposits are forming in the arterial texture, the *middle or fibrous coat* undergoes a morbid change, sometimes becoming *thickened*, and in other instances *wasted*, and its place occupied by the calcareous matter. An analysis of these earthy concretions of the arteries proves their usual composition to be phosphate of lime, and animal matter, in the proportion of about sixty-five of the former to thirty-five of the latter. Such concretions are nowhere more frequent than in the aorta, and they have been met with in every one of its branches. In its abdominal branches, there is some diversity in this respect; for, while the splenic artery is frequently ossified,the hepatic and coronary stomachic are rarely found in this condition. The arteries of the limbs are well known to be often affected in this manner; and every man of experience in the habit of feeling the pulse, must have occasionally perceived the radial artery to be ossified. However, the coats of the arteries of the upper extremity are much more rarely the seat of any diseased alteration, than those of the arteries of the lower limbs.

Sometimes an artery is completely incrusted with earthy matter, so as to form an entire rigid cylinder; and, in other instances, the phosphate of lime is blended with an atheromatus substance. This condition of an artery often lays the foundation for the disease, called *aneurism*. It also sometimes makes an artery incapable of bearing a ligature, which either breaks through the vessel at once, or causes ulceration of it without adhesion. In the Med. Chir. Trans. of London, is a case by Mr. Langstaff, illustrating the inefficiency of the ligature on the ossified arteries of a stump; with another by Mr. Lawrence, proving that an ossified artery may sometimes be tied with success.

Aneurism is defined to be a tumor formed by arterial blood, and communicating with an artery; or it may be said to be generally a pulsating tumor, arising from a dilated, ruptured, or wounded artery, and filled with blood, which, while the disease is recent, and of trivial size, is in a fluid state, but afterwards, when the swelling is larger and has existed a considerable time, is found partly arranged in the form of solid concentric layers upon the inner surface of the cavity or sac. Some forms of aneurism arise either from an alteration of structure, and a consequent dilatation of all the coats of the affected part of the artery, or from a dilatation of the external coat alone, the inner coats having previously given way in consequence of disease or violence.

So long as the boundary of the tumor is formed by all the dilated coats of the vessel, the disease is termed a *true aneurism;* but, when the coats of the artery are wounded, or some or all of them have given way, in consequence of disease, the tumor receives the name of *false or spurious aneurism*. When all the coats of the artery have given way, the blood may be injected extensively into the cellular tissue, so as to make a *diffused false aneurism;* or collecting in one mass, it may soon become bounded by a kind of cyst formed around it by the adhesive inflammation, so as to constitute, what is termed, a *circumscribed false aneurism.**

Another rare variety of aneurism is that where, in consequence of the destruction of the outer coats of the aorta by disease, the internal coat yields to the impulse of the blood, and becomes dilated into an aneurismal pouch.

This form of aneurism has hitherto been noticed only in the aorta, the lining of which is more loose and elastic than that of the rest of the arterial system. Some unequivocal specimens of it were collected by Dubois and Dupuytren, and an excellent illustration of it is contained in Mr. Liston's museum. What is termed the *aneurismal varix*, or *venous aneurism*, is a dilatation of part of a vein, from the gush of blood into it from a neighboring artery. Of course, the existence of such a disease implies a preternatural communication between the two vessels.

The *aneurism by anastomosis*, as it was called by Mr. John Bell, ought not properly to be arranged with aneurisms, as it is of a totally different nature, being the growth of a new tissue, which is compared to what the French term the *erectile tissue*, abounds in blood, and, when wounded, pours it out so profusely from every point, and even from its smallest vessels, which seem to have no disposition to close, that the hemorrhage is truly alarming.

We are then to understand, that aneurism may be produced either by the rupture, or the dilatation of the coats of an artery, or by a combination of both these circumstances, the dilatation having preceded the rupture. The truth of the doctrine of aneurism by dilatation of all the arterial coats, unattended with ulceration, or laceration of the middle and internal ones, was disputed by Scarpa; but, the correctness of that view, as first taken by Morgagni, and subsequently confirmed by the valuable researches of Mr. Hodgson and others, is now universally admitted. The dilatation of all the coats of an artery may then precede the rupture of the vessel, as is often illustrated in the aorta, where the coats of the vessel can sometimes be traced throughout the whole extent of the expansion, while the inner surface of the sac at the same time presents appearances peculiar to the coats of arteries. But the state of dilatation, preceding rupture, is not confined to the aorta; it has been noticed by Mr. Hodgson at the bifurcation of the carotid and iliac arteries, and also in those of the extremities. In the cases to which I refer, all the coats were dilated and extended over the aneurismal swelling, and not merely the external coat.

---

* M. Lisfranc recognizes but two forms of the disease, the *traumatic* and the *spontaneous. Des différens Méthodes et des différens Procédés pour l'Obliteration des Artères*, &c. 8vo Paris, 1834. Rejecting from aneurismal diseases mere extravasations of blood, usually described as diffuse false aneurisms, he confines the name of traumatic aneurism to a tumor produced by blood escaping from an opening in an artery, and forming for itself a sac at the expense of the surrounding tissues. These views seem correct.

Notwithstanding these facts, the most common form of aneurism undoubtedly corresponds to Scarpa's description, and is attended with a disease and giving way of the internal coats of the artery, followed by the dilatation of the outer tunic, which, after a time, may also burst, and allow the blood to be effused.

When the disease consists of dilatation only, without any rupture, or ulceration of the inner tunics of the vessel, the swelling is generally of an oval shape; but when the internal coats have given way, a lateral prominence is formed, which gradually increases in size. Scarpa considers the morbid dilatation of an artery, unattended with rupture of its coats, as a disease totally distinct and different in many particulars from aneurism. He represents the root of an aneurism of the aorta as never including the whole circumference of the tube of the artery, but as occupying only one side of the vessel, from which the aneurismal sac rises in the form of a tuberosity appended to it, and of various size and extent, according to its situation, and the stage of the disease.

On the other hand, he describes the dilatation of the artery, as constantly affecting the whole circumference of the tube; the blood is yet within the proper cavity of the vessel; no layers of coagulated blood are ever found in the cavity of the dilated portion of the artery, as in aneurism; and, so long as the continuity of the proper coats of the vessel remains entire, the circulation is not perceptibly affected. In aneurism, as defined by Scarpa, the blood passes into a cavity, which is, as it were, out of the track of the circulation; there its motion is necessarily retarded, and there it invariably deposits lamellated coagula, and sometimes in such quantity as entirely to fill the cyst. If any solutions of continuity happen upon the inner surface of a morbid dilatation, it is only within the cavities and inequalities of such parts that lamellated coagula are deposited, and all the rest of the inner surface of the disease is entirely free from them. These solutions of continuity are looked upon by Scarpa as the beginning of aneurism, formed subsequently to the simple dilatation. These facts are worth recollecting, whatever view we may be inclined to take of the usefulness of discriminating the mere dilatation from aneurism.

Whether an aneurism begin with dilatation, or not, a rupture, or ulceration of all the coats of the artery, usually follows in a more advanced stage of the disease. In most instances, the aneurism is formed by a destruction of the internal and middle coats of the vessel, and the expansion of the external one into a sac, which at last, giving way, the sheath of the artery, and the surrounding parts, whatever they may be, form the boundary of the tumor. The rupture, or ulceration of the internal and middle coats, is not, however, always followed by aneurism of the kind just now described. Laennec met with a case, in which the internal and middle coats had been divided by a narrow transverse fissure, extending over two-thirds of the circumference of the artery; and the blood, instead of distending the external coat into a sac, had insinuated itself between it and the middle fibrous coat, and dissected them from each other, through more than half the circumference of the artery, from the arch of the aorta down to the common iliacs. Fissures of the kind described result from cracks, or lacerations occasioned by calcareous deposits; but the case reported by Laennec, and another by Mr. Gutherie, are the only instances on record, where such a fissure was followed by more than a circumscribed effusion of blood around it.

In the Dublin Hospital Reports (vol. iii.) is the history of another new kind of aneurism related by Mr. Shekelton: the blood had forced its way through the internal and middle coats, dissected the middle from the external one, to the extent of four inches, and then burst again through the internal and middle coats, into the canal of the artery; thus forming a new channel, which eventually superseded the old one, the latter having become obliterated by the pressure of the tumor.

The sac, formed by the dilatation of the arterial coats, as it increases in size, acquires firm adhesions to the parts in its immediate vicinity, so that when the external coat gives way, the effusion of blood is often still restrained by these adhesions, and the extent of the aneurismal cavity then goes on increasing only gradually. Sometimes, however, the aneurismal sac bursts, or rather is lacerated, so suddenly that there is not time for the adhesive inflammation to circumscribe the blood, and an aneurism with extravasation in the cellular tissue is the consequence, generally accompanied by a great increase of danger.

Aneurisms are divided into *external* and *internal;* the former taking place in the arteries of the neck, head, or limbs; the latter in the aorta, or some of its branches within the chest or belly.

Symptoms of true aneurism. A true aneurism, when not situated within the chest or abdomen, commonly begins in the form of a small pulsating tumor, which subsides under pressure, and immediately becomes prominent again, when the pressure is discontinued. It also diminishes, becomes less prominent, and beats feebly or not at all, when the artery, leading from the heart, is compressed; but directly the compression is removed, the swelling becomes as full and conspicuous as ever again, and pulsates with its original force. At first, there is not much pain; and as in this stage the blood in the tumor is all fluid, and no lamellated coagula are deposited on the inside of the sac, the swelling throbs distinctly and forcibly.

In a more advanced stage, the tumor is larger and more rapid, and the sac cannot be completely emptied by pressure. A part of the blood in it is now in a solid state, and the sac and the adjoining cellular tissue are much thickened. The size of the swelling and its pressure on the surrounding parts next begin to give pain, and obstruct the circulation. The pulsation, however, though not so strong as at first, is yet distinct. In a still later stage, the size and solidity of the aneurism are more increased, and the pulsation is so weak that it can only be felt at that part of the swelling which is directly opposite to the communication between the artery and the sac. The sac is now almost full of lamellated coagula, and contains but a small quantity of fluid blood. If the case be a popliteal aneurism, the pressure on the posterior tibial nerve causes severe pain in the foot and toes; and the nerve itself may at length become as flat as a riband, and its texture scarcely recognizable. The pressure may also obstruct, or even obliterate, the popliteal vein; and these effects, and the pressure on the lymphatics, will account for the œdematous swelling of the leg, in the advanced stage of the disease. As soon as the tumor has filled up the popliteal space, the patient cannot completely extend the leg, nor place his heel on the ground. In the diagnosis it is important to remember, that pulsation is by no means a certain proof of a disease being aneurism, and also that a tumor may be an aneurism, though it may be destitute of pulsation. I was once sent for to Egham to give my opinion on an enormous tumor in the epigastric region, attended with pulsations as strong as those of the aorta itself. The patient under the care of Mr. Gilbertson, was a young man about twenty, and one protuberant part of the swelling was on the point of giving way. Now, a correct judgment was formed of the nature of the case, which was only a large chronic abscess, by the consideration that, if the disease had been an aneurism of this magnitude, the patient would have suffered not only excruciating pain from its pressure, and the action of the diaphragm would have been more obstructed, but the functions of the stomach and bowels would have been seriously interfered with. In fact, the swelling had formed in the quiet and insidious manner that many chronic abscesses do arise, and had attained a large size before it attracted notice. Some useful light was also thrown on the case by the fact of the patient having had, when a boy, a scrofulous abscess of the hip.

I once had an opportunity of seeing another considerable abscess between the quadratus lumborum muscle and the peritonæum, where the tumor was so affected by the pulsations of the aorta that the tumor, which was of immense size, throbbed with surprising force, so as to assume very much the external character of an aneurism of that vessel. The discharge of the contents of the tumor by puncture manifested the true character of the disease.

Pulsating tumors, not of the aneurismal kind, may sometimes be known by their not pulsating equally in all directions as aneurisms usually do. The two abscesses, which I have mentioned, could not, however, be discriminated by this criterion. Every part of them within the reach of examination throbbed with equal force. Besides, we know that, in aneurisms attended with much deposit of lamellated blood in the sac, the pulsation is often much more distinct at one point than another.

Another better criterion, if the tumor be moveable and admit of partial displacement, is to press it to one side, or raise it from the artery near it, when, if it be not an aneurism, it will be found to possess no pulsation. If it be an aneurism, its pulsation will not be lessened by any change in its position.

We have also one valuable source of information in the stethoscope; for, if the case be an aneurism, we may, with the assistance of this instrument, and sometimes without it, if the ear be applied close to the swelling, be able to hear distinctly the passage of blood into the sac, causing a sound compared to that of the working of a pair of bellows.

If it be a fact, as it certainly is, that many pulsating tumors are not aneurismal, it is quite as well established that a swelling may be of this nature, though unattended with any kind of throbbing whatsoever. When aneurisms change from the circumscribed to the diffused state, and the blood rushes from an aperture in the sac extensively into the cellular tissue, the pulsation generally undergoes a considerable diminution, or even a total cessation.

The same things often happen when an aneurism attains a large size, for then the sac is thickened, and much or even the whole of the sac may be occupied by considerable masses of pale-colored firm coagula, arranged in concentric layers.

The absence of pulsation may lead to serious and fatal mistakes in practice: aneurisms have often been mistaken for abscesses and opened, and the patients destroyed by hemorrhage. I once saw a case, where a popliteal aneurism, which was undergoing a spontaneous cure by the deposit of firm layers of coagulated blood in the sac, was amputated under the idea that the swelling, which had no pulsation in it, was remarkably hard, and extended far forwards over each side of the knee, was an osteo-sarcoma, or some other anomalous incurable swelling. A puncture was first made in it; but, as the contents of the sac were solid, the hemorrhage was not such as it would have been in a less advanced period of the disease.

Symptoms of diffused false aneurism. In this case, the pulsations are generally feeble and indistinct; the part or limb is cold; and, in consequence of the extensive injection of the cellular tissue with blood, the skin is more discolored than in a circumscribed true aneurism, unattended with inflammation.

The form of aneurism, produced by the bursting of the sac of a true one under the skin, or even more deeply from the surface, is termed a *secondary false one.* When this happens, the patient is sometimes conscious of a laceration or giving way of something within the limb; the tumor frequently undergoes a great and sudden change in its shape, and there is a rapid increase in its size; it spreads all at once over a greater extent of the limb or part, or becomes *diffused*. At the moment when these changes commence, the temperature of the limb falls, and there is a material decrease in the force of the pulsations, which in two or three days are entirely lost. Some time ago, I had a patient, in whom several of these facts were illustrated; but a degree of ambiguity was created by the circumstance of no particular change in the shape of the limb having followed the bursting of the sac. This was owing to its having given way in a very deep situation at the back of the head of the tibia, whence the blood escaped into the cellular tissue under the gastrocnemius muscle down to the tendon of Achilles; and, as the œdema had been previously considerable, if any sudden increase of the swelling did occur, it was concealed. Doubts are therefore entertained whether the reduction and stoppage of the pulsation arose from the deposit of lamellated blood in the sac, or from the change of the aneurism from the circumscribed into the diffused state. I then held a consultation with Mr. Lawrence; and the latter gentleman thought he could distinguish the bellows sound, proving that there was yet a jet of blood in the sac, and that the communication between it and the artery could not be entirely closed.

The sudden diminution or cessation of pulsation, and an equally sudden change in the shape and extent of the tumor, accompanied by a rapid fall in the temperature of the limb, and more or less discoloration of some part of it, resembling that of ecchymosis, seem to be the circumstances indicating the change of the aneurism from the circumscribed to the diffused state. This occurrence, instead of lessening the danger, always greatly increases it, by bringing on a disposition to mortification.

When all the coats of an artery have given way, and the arterial sheath contributes to the formation of the aneurismal sac, it becomes thickened, partly by a condensation of the surrounding cellular tissue, and partly by the deposit of fibrine upon its inner surface.

The lamellated blood, within an aneurismal sac, is always arranged in concentric layers, the furthest of which from the centre of the swelling acquire surprising firmness, and are so adherent to the inside of the tumor, that they seem as if they were confounded and blended with the parietes of the sac itself.

The commencement of the deposit of fibrine upon the internal surface of an aneurismal sac, soon follows the origin of the disease, and seems designed by nature as some protection against hemorrhage, and as a means of strengthening the boundary of the aneurism, and resisting the impulse of the blood against it. Sometimes, by filling up the whole cavity of the sac, it becomes, indeed, the means of a spontaneous cure.

This deposit of fibine takes place, as I have explained, in successive concentric layers, which have a different aspect according to the date of their formation. The most central consist simply of blood more or less firmly coagulated, and sometimes probably formed after death. A little farther from the centre, the coagulum is drier, paler, and evidently composed of a large proportion of fibrine. Lastly, in contact with the cyst, are layers of the same substance, but completely opaque, of a somewhat friable consistence, and very closely resembling meat deprived of its red color by boiling. The most recent layers adhere to one another but slightly; the old ones very firmly.

It appears, then, that these lamellated coagula are formed by successive deposits of the fibrine of the blood; and their production seems to be owing, in a great measure, to the retarded motion of the blood in the sac. Hence, they are more readily produced in false than true aneurisms, because, in the former cases, the communication between the canal of the artery and the sac of the aneurism is narrower. This deposit of lamellated blood is not vascular and organised, and the pus sometimes found within it, is, according to Cruveilhier, secreted by the inner surface of the sac, and then insinuates itself between the concentric layers. While these changes are going on within the sac, its outside becomes connected to all the adjacent parts by the adhesive inflammation. Nor do those parts themselves remain unaffected. Sometimes they are simply displaced, or compressed by the aneurismal swelling; sometimes they are more or less absorbed and destroyed from the effect of its throbbing and pressure. In certain cases, ulceration is produced; in others, sloughing.

Thus, in aneurism of the aorta, large portions of the ribs and sternum are destroyed, and the tumor protrudes externally. If the swelling should make its way through the ribs in the direction backward, it may then come in contact with the scapula and occasion a remarkable displacement of that bone, as occurred in a patient some time ago at the Bloomsbury Dispensary. Frequently the bodies of the vertebræ suffer, and the aneurism may even penetrate the spinal canal, so as to press upon the medulla, and occasion a sudden paralysis. This last effect of aneurism, however, is exceedingly rare. It is curious to observe, that, while the bodies of the vertebræ are thus more or less destroyed by absorption, the intervertebral substance itself frequently remains perfect.

Sometimes an aneurism of the aorta produces serious effects upon the organs contained in the thorax, or abdomen; compressing, or even making its way by ulceration into the pulmonary artery, or right auricle of the heart, or by a kind of lacerated fissure into the pericardium; by ulceration, into the œsophagus, the trachea, the bronchi, the lungs, stomach, or some part of the intestinal canal. The vena cava, the subclavian vein, and even the thoracic duct, may be obliterated by the pressure of aortic aneurisms. In one case of aortic aneurism in the abdomen, paralysis was brought on by the pressure of the swelling on the nerves of the lower extremity, and not by the effect of the disease of the spine itself and spinal cord.

The tumor may also burst either into the pleura, or the peritonæum. Just in the same manner as the lungs may be compressed, and altered in their shape by the pressure of an aneurism within the chest, the kidneys, and other viscera may be similarly affected by the pressure of an aneurism of the abdominal portion of the aorta.

In the vicinity of certain aneurisms, we not only often find the veins obstructed, or obliterated, but the large nerves converted into flat expansions like ribands, the muscles singularly wasted, and the bones either deprived of their periosteum and carious, or else that membrane thickened, and osseous matter so profusely thrown out, that it extends more or less round the aneurismal swelling. Sometimes the sternal end of the clavicle is dislocated by aneurismal tumors. The absorption of bone, produced by the pressure of aneurisms, is different from ordinary caries in not being accompanied by the formation of pus; and experience proves, that, if the aneurism be cured, the state of the bones rarely gives any future trouble.

An aneurism, having made its way through all the coats and the cellular sheath of the vessel, becomes bounded by whatever parts or textures happen to lie near it. Thus, in aneurisms of the aorta, a portion of the cyst may be composed of the side of the œsophagus, the trachea, the substance of the lungs, or even the bodies of the vertebræ deprived of their periosteum.

When an aneurism is about to burst externally, a conical inflamed prominence forms on the swelling, and here a small slough is produced, on the loosening of which the effusion of blood takes place, which destroys the patient either in a few seconds, or by repeated returns of hemorrhage. The process by which such an aneurism gives way, then, is neither laceration nor ulceration, but the production of a slough, which becomes loose, and the fatal bleeding ensues.

When an aneurism extends into a cavity lined by a mucous membrane, as the œsophagus, intestines, or bladder, the process by which it bursts may be similar, namely, a small slough may be formed on the mucous membrane; but generally the rupture takes place by ulceration. When, however, the tumor makes its way into a cavity lined by a serous membrane, the process is different; for a crack or fissure is then produced in the latter texture after it has been rendered very thin by the effect of distension, and the blood is discharged into the cavity of the pericardium, pleura, or peritonæum, according to the circumstances of the case. An aneurism of very moderate size, situated at the root of the aorta, within the pericardium, will frequently give way and prove immediately fatal.

Sometimes aneurisms prove fatal by their pressure on important organs, and the patient is destroyed neither by internal, nor by external hemorrhage. A patient, from whom one of Cruveilhier's engravings was taken, was destroyed by the compression of the trachea. What is remarkable, also, is the total disorganisation, produced in a portion of the pneumo-gastric nerve, by the pressure of one of the aneurismal swellings. It was flattened and converted into a fibrous substance for some extent, without any vestiges of nervous tissue. The patient had had continual vomitings, rigors, swoons of considerable duration, general coldness of the body, and inability to keep any solid food on his stomach.

Causes of aneurism. If we exclude from consideration those cases, in which an aneurism arises from the wound of an artery by a sharp or pointed instrument, the spicula of a fractured bone, or the laceration of the axillary artery by the employment of great force in the attempt to reduce dislocations of the shoulder, we rarely meet with aneurisms, which can be positively referred to external violence, unless the artery affected should have been previously in a diseased state. Thus, if the popliteal artery be in a healthy state, no forced extension of the leg will produce a laceration of its coats. To have such an effect, the leg must be extended in a degree that would first rupture the ligaments of the knee-joint.

A predisposition to aneurism seems to depend upon: 1. The large size of certain arteries. 2. The force with which the blood is propelled into them, and against certain parts of them. All these facts are illustrated in the frequency of aneurism of the arch of the aorta. From what has been already stated, the reason why aneurism appears to be frequently combined with hypertrophy of the left ventricle of the heart, must be manifest. 3. Such a situation of an artery that it is left very much unsupported by muscles, and exposed to continual motion and disturbance in the exercise of the part, as exemplified in the popliteal arteries of post-chaise drivers and others.

The arethomatous and calcareous deposits which occur between the internal and middle coats of the arteries, or in the sclerous tunic of Malgaigne, and are often the forerunners of aneurism, sometimes pervade a considerable extent of the aortic system. Pelletan met with sixty-three aneurismal swellings, from the size of a nut to that of an egg, in one subject, from such disease of the arterial coats.

If an artery be sound, mechanically weakening it either by stripping off the outer tunic, or by cutting through the inner ones, by the application of a ligature, and then immediately removing it, so as to let the blood flow through the vessel as usual, will not lead to the formation of aneurism. *Spontaneous* aneurisms are almost exclusively confined to the aortic system; for, of three hundred cases referred to by M. Lisfranc, only two or three were in the pulmonary artery, and these not free from ambiguity.

Aneurisms of the brachial artery and its branches are rarely combined with disease of the coats of those vessels; but arise from wounds, while axillary, aortic, popliteal, and most other aneurisms are generally preceded and accompanied by a morbid change of the arterial coats.*

Men are more frequently the subjects of aneurism than women; according to Mr. Hodgson's calculation, in the proportion of fifty-six to seven; and according to Lisfranc's estimate, founded on a list of one hundred and fifty-four cases, in the proportion of one hundred and forty-one men to thirteen women.

The period of life between thirty and fifty is most liable to aneurism; and, before twenty and after sixty, the disease is very rare. Sir Astley Cooper has known it arise in one person who was eighty, and in a boy of eleven. Lisfranc refers to an aneurismal patient, only thirteen years old, and to three between seventy and eighty, in a list of one hundred and twenty cases. Popliteal aneurism is rare in females, who, when they become the subjects of the complaint, mostly have it either at the bend of the arm from a wound, or in the ascending aorta, or the carotid artery from disease.

Prognosis. An aneurism, left to take its own course, would generally destroy the patient either by hemorrhage, gangrene, or the interruption of the functions of the viscera by the pressure of the tumor. For the most part, internal aneurisms either gradually make their way outwards through the parietes of the chest, or abdomen, and at length prove fatal by external hemorrhage, or else they burst in the cavity of the chest, or abdomen, or within various organs with which the swelling happens to become connected, as the pericardium, œsophagus, trachea, intestines, &c.

On account of the impossibility of practising any surgical operation for the cure of various internal aneurisms, and also because such diseases affect vessels into which the blood is propelled by the heart with extraordinary force, the prognosis is infinitely more unfavorable, than in external aneurisms. The danger is often likewise seriously increased by the mechanical effect of the swelling upon important organs. Thus the pressure of aneurisms of the aorta upon the œsophagus, trachea, lungs, pneumo-gastric nerve, and other parts, whose functions are highly important to life, adds considerably to the risk, and has sometimes had such an effect upon the health, that the patient even dies before the aneurismal tumor bursts. This happened in the case recorded by Cruveilhier. The prognosis will be much more unfavorable, when the patient has more aneurism than one, a circumstance showing a tendency to disease in the arterial system at large. Sometimes, in such cases, soon after an operation has been performed for the cure of an external aneurism, the patient dies of the rupture of an internal one of the aorta. Indeed, it is always a requisite precaution to ascertain, if possible, whether an aneurism on which we are about to operate, be the only one. If there be any internal aneurism, besides another situated in one of the limbs, we should not be justified in operating upon the latter. In one case of this description, operated upon by Sir Astley Cooper, no sooner had the first incision been made, than the patient fell back, and died in a few minutes. On examination of the body, the pericardium was found distended with blood, which had escaped from an opening in an aneurism, seated at the beginning of the aorta, immediately above the semilunar valves.

---

* One aneurism of the brochial artery, from disease of the arterial coats, is recorded by Pelletan, and another by Mr. Hodgson, but the occurrence is rare.

Supposing there were two aneurisms on the same limb, for instance, one of the femoral and another of the popliteal artery, but unattended with any signs of internal aneurism, we ought to tie the artery in the groin, or the external iliac, by which means we might accomplish a cure of both aneurisms at once.

The prognosis in aneurism depends also in some measure upon the *size*, as well as the *situation* of the tumor. Generally speaking, the larger the aneurism is, the more tedious and uncertain is the cure. The magnitude of the swelling materially prevents the establishment of a collateral circulation, for its pressure may have obliterated the principal anastomosing branches. It not only has this effect, but it produces a total change in the large nerves, flattening them into the shape of ribands, and rendering the great veins impervious. In addition to such mischief, which necessarily creates a tendency to gangrene, the pressure causes vast disorganisation of all the other neighboring textures, muscles, bones, and joints.

If a popliteal aneurism be suffered to attain an enormous size, under the erroneous notion of affording time for the anastomosing vessels to enlarge, we not only incur the risk of the aneurismal sac bursting under the skin, and of the aneurism changing from the *circumscribed* into the *diffused* state, a serious change indeed for the worse; but such disease of the head of the tibia, condyles of the femur, and all the adjacent parts may take place, as will render the patient for a long time, or even permanently, a cripple, notwithstanding the cure of the aneurism itself.

In the case of a diffused aneurism, following a circumscribed one of immense size, and accompanied by enormous extravasation of blood in the cellular tissue, mortification will frequently follow, whether the artery be now tied or not, and if the patient be then saved, it is only by amputation of the limb.

In the case of a single aneurism so situated, that the artery leading directly to it can be readily secured, and occurring in a person otherwise healthy, and not too far advanced in years, the prognosis is favorable, provided the operation be done according to the right principles.

An oval dilatation, extending to the whole circumference of an artery, is set down by Scarpa, as incurable. At the same time, this form of disease may remain stationary for a great number of years, and often has no decided influence in shortening life.

Spontaneous cure of aneurism. Aneurisms, even when not submitted to surgical treatment, do not always terminate fatally, but in a small proportion of cases undergo a *spontaneous cure*, which may be brought about in various ways.

1. The most common mode of cure is such an increase in the quantity of lamellated blood in the aneurismal sac, that its cavity becomes filled up, and then of course the circulating blood no longer passes through the aneurism, but is conveyed to the parts beyond the disease through the collateral vessels. The pulsation of the tumor ceases, the sac is gradually diminished, the solid layers of fibrine are in time absorbed, and the whole of the tumor is, by degrees, nearly or entirely obliterated.

Not only is the sac filled up by successive deposits of laminated blood, but the artery itself becomes blocked up with the same substance, both upwards and downwards, to the places where the next large collateral branches are given off above and below the tumor.

Now this desirable accumulation of laminated blood in the sac, is denoted by the cessation of the bellows' sound; by the tumor becoming more solid, and its pulsation being stopped, without any sudden increase of its size, or fall in the temperature of the limb, circumstances attending that stoppage or reduction of the pulsation of an aneurism, brought on by the change of the disease from the circumscribed to the diffused state.

2. Another mode of spontaneous cure is that in which the aneurismal tumor presses upon the portion of artery leading directly to it, so as to produce inflammation of the vessel, followed by an impervious state of it. Here the accidental shape, position, and direction of the tumor, do nearly the same thing, as is accomplished by the most approved surgical treatment.

3. A third manner, in which a spontaneous cure happens, is when the whole aneurismal swelling inflames, and sloughs away, attended with such an effusion of fibrine in the adjoining portion of the aneurismal artery as renders it completely impervious. When the sac inflames deeply, and abscesses form in an aneurism, the same consequences ensue. But, when the inflammation and sloughing do not reach to a sufficient depth, the communication between the artery and aneurismal sac may not be obliterated with fibrine, and the

patient may then die of hemorrhage on the detachment or loosening of the sloughs.

4. A fourth mode of spontaneous cure happens when the pressure of one aneurism extends its effects to the artery leading to another so as to cause an obliteration of such vessel. Of this variety of spontaneous cure, Mr. Liston mentions one remarkable instance: the patient had an aneurism of the subclavian artery which had attained a considerable size, but afterwards gradually subsided and disappeared. When the patient died, the cause of death was found to be the rupture of an aneurism of the arteria innominata, which had made such pressure on the subclavian artery as to have obliterated it, and produced a cure of the aneurism in the axilla.

In whatever manner the cure is affected, the artery is almost constantly transformed into a kind of dense impervious chord in the situation of the disease. Scarpa lays down this as an invariable and essential circumstance, without which an aneurism cannot be cured. Perhaps, the only exceptions to this statement are some examples of aortic aneurism, where the sac is of moderate size, and completely filled with the fibrinous part of the blood, at the same time that the canal of the aorta remains perfectly unobstructed. Some cases of this description are recorded in Hodgson's Treatise on the Diseases of Arteries.

Treatment of aneurism. As the enlargement of every aneurism and its ultimate rupture, depend upon the force with which the blood is thrown into the swelling, the most important principle in the treatment must necessarily consist in lessening the impetus of the circulation, or even in preventing the entrance of the main current of blood into the aneurismal sac altogether. The latter of these plans is the only one, upon which much dependence can be placed. Unfortunately, however, it is quite inapplicable to certain aneurisms, the situation of which renders it totally impracticable to adopt the necessary proceedings for the accomplishment of the principle in question. Under these circumstances, we are obliged to be content with the employment of means calculated to reduce the general impetus of the circulation, and to maintain it in as quiet a state as possible.

In aneurisms of the aorta, a low diet, abstinence from animal food, occasional venesection, the exhibition of digitalis, and the avoidance of much exercise and of all laborious pursuits, are the means commonly recommended; rather in the hope of retarding the progress of the disease, than of bringing about its cure. By means of such treatment, however, the suggestion of which originated with Valsalva, who also applied ice and other cold applications, when there was an external tumor, the success has sometimes exceeded the expectations formed of it; and if we are to believe the histories of some cases recorded by Pellatan in his Clinique Chirurgicale, and by other writers, aneurisms of the aorta, so large that they protruded through the absorbed ribs and sternum, have thus been reduced and cured. I saw a case, in which the external swelling subsided in consequence of the aneurism bursting into the œsophagus, and a profuse bleeding taking place, which brought on syncope, and then stopped. The patient lived a quarter of a year after this first rupture of the aneurism, and then fell a victim to the return of hemorrhage.

One caution is necessary, with respect to bleeding in cases of aneurism of the aorta, namely, to avoid producing syncope, as it is attended with considerable risk of the circulation not being restored again. Hence, the blood should be taken away slowly from a small orifice in the vein, while the patient is in the recumbent position, and only in the quantity of a few ounces at a time.

Sometimes also the attempt to cure external aneurisms on the principle of lessening the impetus of the circulation has been made, though not with much success. In Pelletan's Clinical Surgery, may be found one or two instances of a cure of subclavian aneurism, on Valsalva's plan, but they are very rare; and as they sometimes happen from other causes, some doubts may be entertained, respecting the share which the treatment had in bringing about the desirable event. I have seen one example of spontaneous cure of an axillary aneurism.

We have, however, one means which can be tried in cases of external aneurism, which is not applicable to internal ones; namely, pressure, which operates on the principle of checking the impetus of the blood in two ways. Thus, when a bandage is applied with the nicest equality over the whole limb and tumor, as advised by Scarpa, it can only do good by retarding the circulation in the limb generally, and thus promoting the coagulation of the blood in the sac. The plan does not appear to contemplate the interruption of the main stream of blood to the aneurism, as is aimed at when the surgeon tries pressure in another way, and directs it against the portion of artery near the swelling, and through which the blood is conveyed into the sac.

Whenever pressure is tried, whether in one manner or in the other, the plan should be combined with Valsalva's treatment, especially a low regimen, perfect quietude, occasional venesection, the administration of digitalis, and the application of ice, or cold evaporating lotions to the tumor.

Pressure made on the artery, with the view of obstructing the passage of blood into the sac, rarely answers. Few patients can bear the pain which arises from it, and it is exceedingly difficult to make it operate effectually.

There is indeed but one method, on which a reliance can be placed as a means of fulfilling the great principle of cure, namely, *that of preventing altogether the continuation of a powerful stream of blood into the aneurismal sac*. The method alluded to consists in cutting down to the principal artery, by which that fluid is conveyed into the aneurismal sac, and then applying a tight ligature round it, by which means we not only immediately stop the main current of blood to the aneurism, but excite such changes in the tied portion of the vessel as lead to its permanent obliteration. The pulsation of the swelling directly ceases; what fluid blood may be in the sac being now in a more or less stagnant condition, gradually assumes a solid state; the portion of the artery between the sac and the ligature becomes filled with coagulum, and a gradual obliteration of the aneurismal swelling is the result; the artery itself is converted into an impervious cord; the lamellated and coagulated blood in the sac is by degrees absorbed; and at length the tumor dwindles entirely away, or is quietly reduced to one, the size of which is so inconsiderable as to create no inconvenience. The artery is generally rendered impervious, not only for some way above the tumor, but also for some way below the sac down to the giving off of the first large collateral branches. There are cases, however, in which a diminished circulation in the sac goes on after the operation, and even a degree of pulsation may either continue or return, in consequence of the blood finding its way by anastomoses into the portion of the artery immediately above the tumor, which, for some time at least, remains pervious.

The old method of operating consisted in opening the tumor, taking out the lamellated blood, finding out the communication between the sac and the artery, and applying a ligature above and below it, the cavity being then filled with lint, and left to suppurate. Instead of this practice, modern surgeons avoid opening the tumor, and content themselves with the more simple and better plan of exposing the artery at some convenient point of its course towards the aneurism by an incision, from two to three inches in length, and then tying the vessel with a smallish but strong ligature, calculated to divide the inner coats of the vessel, and to bring about its closure by the adhesive inflammation.

In the observations, delivered on the subject of hemorrhage, I have explained the principles to be observed in the choice and application of ligatures. A few maxims require particular attention in operations for aneurism. 1. We should always *make a sufficient incision in the skin;* for, if it be too small, all the rest of the operation will be tedious and difficult; the artery will not be found and tied without a good deal of handling of the parts, and the patient, instead of being saved from pain, will suffer much more, than if the external wound had been made of proper size. 2. *Avoid the inclusion of any large nerve or vein in the ligature.* 3. In order to avoid more certainly the inclusion of the vein, or the wound of it, *the point of the needle is generally introduced between the artery and vein*, and brought up on the side of the former, away from the latter vessel. 4. A free external opening in the integuments would be useless if not followed by *a free incision in the fascia.*

I am glad to find Dupuytren joining in this doctrine, which I have always inculcated. "The external incision (says he) must be sufficiently large to admit of free manipulation, with respect to the vessel, and *the aponeuroses must be more extensively divided, than the skin.*" 5. *Never tie the arterial sheath*, as such practice would not only render the ligature less likely to produce a proper effect on the artery itself, but make the completion of its detachment tedious and protracted. *The sheath* ought to *have a very limited opening made in it*, for all that is required is room for the passage of the needle round the artery; and a larger division of the sheath than is necessary for this purpose, will only lead to disturbance of the artery, or even a detachment of a larger portion of it, than is advisable, from its cellular and vascular connexion with the interior of the sheath. At all events, the artery should be fairly tied by itself, without any unnecessary separation of it, or of its sheath, from their surrounding connexions. Hence, the practice of insulating the artery for some extent, so as to be able to put the finger under it deserves reprobation. All we have to do is to pass a small ligature, by means of an aneurismal needle under the vessel, and this may be done, after the arterial sheath is opened, without any rough handling of the vessel, or any material separation of it from its natural connexions. If we were to separate the artery from those connexions, which supply its vasa vasorum with blood, how could we expect any healing process to take place in it? Ulceration or sloughing would certainly occur, instead of the adhesive inflammation, and, after a short time, profuse and fatal secondary hemorrhage, instead of the cure of the aneurism.

The knowledge of the value of the principle, which dictates the avoidance of the detachment of the portion of artery which we are about to tie, from its natural connexions—which points out at the same time the prudence of not disturbing such portion of artery any more than can be avoided—will enable us immediately to make a due estimate of various ingenious, but unsafe contrivances, intended to render the obliteration of the artery more certain, but which have in reality quite a contrary effect. Another frequent cause of hemorrhage, in former times, was the employment of thick clumsy ligatures, which also were not applied with due tightness, lest they should injure the coats of the artery.

As a guard against secondary hemorrhage, the old surgeons sometimes had recourse to *ligatures of reserve;* one or more ligatures were put loosely round the vessel above that which was tightened, so that if the latter failed, the others might be immediately tightened.

But it is manifest, that these ligatures of reserve were the very things likely to produce a risk of hemorrhage. They were objectionable as extraneous irritating substances in contact with the artery; they were objectionable as requiring for their application a more extensive denudation and a considerable disturbance of the vessel.

In short, their employment was entirely repugnant to those wise maxims in the treatment of wounded and aneurismal arteries, which should ever be our guide. The fear of tying the arteries with proper firmness, and the use of irregularly shaped broad clumsy ligatures, sometimes occasioned bleeding in another way, namely, by the noose changing its position, and becoming loose. Thus bleeding came on, almost as soon as, and even sometimes before, the patient had been put to bed. Hence arose the absurd scheme of passing the ends of such a ligature, through the artery, directly below the noose, in order to keep it from slipping.

This suggestion was intended as an improvement on Mr. Abernethy's plan of applying two ligatures, one to the upper part of the exposed portion of the artery and the other to the lower, and then dividing the vessel at the mid-point between them.

With respect to this latter plan, it was founded upon the ingenious comparison of the state of the ends of the arteries thus treated in aneurism, with the condition of the extremities of the arteries upon the face of a stump after amputation. Hemorrhage was formerly found to be much less frequent after amputation, than after an artery had been tied for the cure of aneurism. Mr. Abernethy conceived, that as the ligatures, when this plan was followed, were put on the artery close to the points, where it lay amongst its natural connexions, it would be less likely to ulcerate, and that, by dividing the artery in the interspace between them, its ends would retract, and lie still more perfectly protected by the surrounding parts.

No doubt if, in the operation, a large portion of the artery were detached from its connexions, this practice of applying two ligatures, and dividing the intervening portion of the artery, would be the best, as it would enable us to avoid tying the vessel in the middle of its separated and disturbed part, which is the point most likely to ulcerate or slough, and to apply the ligatures at two points close to where the artery retains the advantages of its natural connexions. But in all other cases, the simple application of a single ligature, with due attention to the rule of making no unnecessary detachment of the artery from its surrounding connexions, is the practice, that now receives the general approbation of all the best modern surgeons.

Having secured the artery with a ligature of proper construction, for instance, with one made of thread, or strong dentist's silk, passed under the artery with an aneurism needle, the point or edges of which should not be so sharp as to endanger the vessel or neighboring vein, nor yet so blunt as to be incapable of going round the artery, without the employment of too much force; we are then to cut off one half of the ligature, on the principle of lessening the quantity of extraneous matter in the wound. The other end of the ligature is then to be brought out and fixed at the nearest part of either side of the wound, which is to be closed with adhesive plaster, so that it may have the best opportunity of uniting by the first intention.

The limb or part is then to be kept perfectly quiet, and everything avoided, calculated to retard the circulation through the collateral vessels, or reduce the temperature of the limb. With respect to the proposals of cutting off both ends of the ligature, of taking away the ligature after it has remained a given time, and of endeavoring to obliterate the artery by the graduated pressure of particular kinds of forceps, and other inventions, after the exposure of the vessel by an incision; I shall merely mention them in this work, as liable to objections, which prevent them from receiving general approbation.

When an artery is tied for the cure of an aneurism, according to the principles which have been recommended, hemorrhage after the operation is a rare event, unless the artery happen to be diseased where the ligature is applied to it, or some considerable branch arise close above the point at which such ligature embraces the vessel, in which case, we know, that the formation of a clot within it is likely to be prevented.

When hemorrhage does follow an operation for aneurism, it is not always necessary to cut down to the artery and tie it again, as a matter of course, because experience proves, that in a certain number of these cases, the hemorrhage either stops of itself after six or eight ounces of blood have been lost, or else is readily suppressed by the employment of cold and moderate compression. No doubt, the partial closure of the end of the vessel, sometimes effected, will suggest an explanation of these circumstances. However, if the bleeding were not to be easily controlled, the tying of the vessel higher up would be indispensably requisite to save the patient's life.

In some examples, the aneurismal swelling, instead of being quietly and gradually removed by the absorbents after the successful obliteration of the artery by the ligature, is attacked with inflammation, and a considerable abscess forms, attended with severe constitutional disturbance. No sooner is an opening made, than a copious discharge of fetid matter takes place, blended with coagulated blood. Various cases prove, that under these circumstances, there is generally no bleeding from the opening in the sac. For besides the security, arising from the obliteration of the artery by the ligature, there is the additional security resulting from the changes produced in the sac itself by inflammation, which, if they had occurred sooner, would probably have led to a spontaneous cure, and render the use of the ligature needless.

In the St. Marylebone Infirmary, however, Mr. Perry had a case, in which, after the rupture of the aneurismal sac in the state of suppuration, subsequent to the ligature of the femoral artery, the patient fell a victim to returns of profuse hemorrhage.

Of Brasdor's method of operating upon certain aneurisms. When a carotid, femoral, or subclavian aneurism leaves no room for the safe application of a ligature between the tumor and the heart, Brasdor conceived, that if the artery were tied on the other side of the swelling, a cure of the disease might be the result, because, though the sac would probably become even more distended for a time than it was previously, yet the transmission of blood through it being more or less impeded, and its motion stopped or retarded, its coagulation would be promoted. The experiment was first imperfectly and unsuccessfully attempted by Deschamps. It was completely executed, perhaps for the first time, by Sir Astley Cooper, who took up the femoral artery below the groin, in another case of inguinal aneurism; but the patient died sometime afterwards of the bursting of the tumor. To Mr. Wardrop betongs the merit of having brought the value of this practice to the test of careful examination, and he reports several cases in which the operation proved successful. The examples alluded to were chiefly aneurisms of the carrotid artery, situated very low down. Some instances, however, of aneurism of the arteria innominatu are reported to have been cured by the application of a ligature to the subclavian. Dr. Mott's case, which is amongst them, is free from all ambiguity, and the occasional success of the practice is on the whole satisfactorily established.

But, with respect to the value of this method, it cannot be precisely estimated without additional cases. One would expect the plan to be more suited to carotid aneurism, situated very low down than to any other forms of this disease, because one advantageous circumstance would be the current of blood through the aneurism thus being completely stopped, which object the ligature would effect in few instances, except carotid aneurism, owing to the origin of arterial branches between the ligature and the sac. But as the common carotid gives off no such branches, it seems to be well suited for this operation. In axillary and inguinal aneurisms circumstances are very different; for, with respect to inguinal cases, unless we could tie the femoral artery above the profunda, the circulation through the sac would go on so freely, that any favorable change in the disease would certainly be much less likely to result from the operation, than in the instance of a carotid aneurism. And, as for axillary aneurism, several large branches arise so near the tumor, that a ligature could not be placed between them and the *distal* side of the swelling, and through them so free a circulation of blood would be maintained in the sac, that the prospect of success from the operation must be less encouraging than in a similar operation on the carotid. Further experience must, however, decide the question of the fitness of the method of various cases. The fact, that the ligature of the subclavian has already cured aneurism of the arteria innominata certainly proves, that sometimes a reduction of the motion of the blood, far inferior to its complete stagnation, will have the desired effect. We know that, in the generality of popliteal aneurisms, a retarded passage of blood through the sac continues for a certain time after the operation, and that even a degree of pulsation will occasionally return; but that these circumstances do not usually prevent the progressive increase in the quantity of coagulum from terminating in a cure.

The operation may be calculated for one case, and not for another; whether it will ever be the means of curing an inguinal or a subclavian aneurism, remains to be proved. One interesting case was under the care of Mr. Lawrence, where the pressure of a femoral aneurism obliterated the artery below the swelling, yet such change had not the effect of curing the disease. The same thing was here accomplished as is aimed at in the operation, but without any useful result.

Of the anastomoses after operations for aneurism. It might be supposed that the anastomosing vessels would become more numerous and conspicuous, in proportion to the length of time from the operation. But the researches of Sir Astley Cooper prove, that the reverse of this is the fact; for, at first, a great many vessels convey the blood originally conducted by the principal artery, and, after a time, their number diminishes, only a few vessels, conveniently situated for carrying on the new circulation, and adequate to this purpose, remaining in an enlarged state. The method of taking up particular arteries will be noticed in the third section of this publication.

DISEASES OF VEINS.

The difference of texture between veins and arteries; the more moderate impetus of the blood in the former vessels; the presence of valves in many of them; their greater tendency to inflammation; and the higher degree of danger attending that inflammation; are circumstances at once apprising us, that the diseases of the venous system cannot correspond in every respect to those of the arterial system. Thus the veins are not liable to aneurism, in the common acceptation of this term, or the formation of a tumor upon them produced by the impetus of their own blood, and preceded either by a wound, or a morbid alteration of their coats. The so-called *venous aneurism*, is indeed a swelling of a vein, filled with blood, and accompanied by pulsation, but it is occasioned not by the force of the venous, but of the arterial blood, which, in consequence of an accidental communication existing between a large vein, and a neighboring artery, gushes into the vein, and causes a pulsatory swelling of it.

In or between the coats of arteries, *calcareous deposits* are particularly common, more especially in elderly persons; but in the veins they are very unusual. Indeed, in every part of the sanguiferous system where black blood circulates, the same fact is exemplified. Thus, in the pulmonary artery, and in the right cavities of the heart, ossifications are far more rarely met with than in the aorta and left cavities of the heart.

Small bodies, termed *phlebolites*, and composed of phosphate and carbonate of lime, are occasionally met with in the veins of the uterus, bladder, or testes, varying in size from a millet seed to a pea, and in number from two to twelve. They are situated in dilatations of the veins, and loose enough to let the blood pass between them and the interior of those vessels.

The veins are more frequently *blocked up with coagulated blood* and *lymph* than the arteries.

Pus is also more frequently met with in veins than arteries, a fact which Andral refers to its being sometimes conveyed into veins from other parts by absorption, and sometimes to its being formed in them; whereas, in arteries, pus has only one mode of production, namely, it must be formed within these vessels themselves. The greater disposition of veins to inflammation, must here also be taken into the account.

While the wounds of large arteries give rise to hemorrhage, which is often either directly fatal, or cannot be suppressed without the ligature, those of veins are followed by bleeding, which is of a much more controllable kind. We purposely open veins of considerable size, in order to take blood from the system; yet we seldom find any difficulty in stopping the bleeding, which ceases of itself as soon as the removal of the fillet allows the stream of blood within the vessel to pursue its course towards the heart. But even when venous hemorrhage is more troublesome, it may almost always be suppressed by means of moderate pressure; and, I believe, that when a vein is so situated that it will conveniently admit of compression, a wound of it need not produce any alarm, so far as hemorrhage is concerned, which may thus be readily commanded.

In general, the right method of suppressing venous hemorrhage is pressure; and, as tying a large vein is now known to be frequently followed by a dangerous, extensive, and often fatal inflammation of such vessel, and other parts of the venous system, it certainly ought never to be done, except under circumstances which render the other plan inapplicable or ineffectual.

Of inflammation of veins, or phlebitis. *Phlebitis* is regarded by Cruveilhier as intimately connected with the whole range of pathology. Surgeons should always be apprehensive of it after operations, and physicians in every organic disease that reaches the stage of softening, or that of ulceration. Sometimes phlebitis is restricted to the great veins and their principal branches; this is *ordinary phlebitis;* in other instances, it is seated in the capillary veins, when it is termed *capillary phlebitis*, which seems to Cruveilhier to constitute one essential part of the process of inflammation. Occasionally it affects both the capillary veins and the ramifications connected with them.*

The veins are particularly prone to inflammation, which frequently spreads with considerable rapidity along their internal surface, and this so far as to extend from the point where the affection first commences up to the very heart itself, bringing on a train of formidable and often fatal consequences. We are not, however, to consider the mere redness of the lining of these vessels, often met with in the dead subject, as a proof of their having been inflamed during life: for, after a body has been kept a few days, the inner coat of a vein imbibes and becomes dyed with the red particles of the blood, even more readily than the lining of an artery. The inflammation of a vein is always disposed to extend itself in the course of the circulating blood, but frequently also in the opposite direction. Sometimes it produces an effusion of fibrine, by which the tube may be obliterated, and a more or less entensive portion of it converted into a solid chord. In phlebitis, the great source of danger is the formation of pus within the vessel: in this event, the matter is either mixed with the circulating blood, or the inflammation having produced adhesions, at certain intervals, boundaries are formed for the collections of pus, which then represent a single abscess, or a chain of abscesses in the course of the vessel. If phlebitis advance not beyond the effusion of fibrine, it is termed *adhesive*, which is not productive of the serious risk always resulting from the *suppurative*.

When phlebitis is of trivial extent, and in the adhesive stage, its symptoms merely resemble those of any other common local inflammation of equal extent; but, when it ascends into the principal venous trunks, and pus begins to be formed and circulated with the blood, the disorder is accompanied by violent constitutional disturbance, a quick, small, irregular pulse, hurried respiration, a white dry tongue, which afterwards turns brown; thirst, nausea, sometimes bilious vomiting, pain, and severe oppression about the region of the heart, and a countenance indicative of the utmost distress and suffering. In this aggravated form of phlebitis, the depression of spirits, and prostration of strength, are extreme. Low delirium generally follows, and death in the short space of from three to six or seven days.

The inflamed veins are exceedingly hard, and painful when pressed upon, or kept in an extended state. The skin over them is often of a dark red color, and sometimes the whole limb becomes œdematous and prodigiously swelled, this state being followed by the formation of unhealthy matter diffused in the cellular tissue, or lodged in numerous small collections in the muscular tissue, and attended with sloughing of the cellular and other textures. When inflammation stops at any point within the vein, the lines of its boundary is often determined by the entrance of a branch of the vessel, or the junction of two veins together.

---

* See Cruveilhier, Anat. Pathologique, liv. ii.

What is the principal cause of the gangerous effects of phlebitis? Experience proves, that inflammation of a vein is often followed by the rapid formation of pus in some other part of the body, external or internal, and more or less remote from the inflamed vessel. Thus in phlebitis of the arm it is not unusual for an abscess to be suddenly formed in the axilla of the opposite side of the body; and when the femoral vein inflames after amputation, the patient is often affected with symptoms of disease in the chest, and on examination after death, abscesses are discovered in the substance of the lungs. Sometimes there is a deposit of sero-purulent fluid in the pericardium; sometimes in the pleura; sometimes in the liver or other abdominal viscera; and occasionally in the synovial membranes of the joints. No doubt, these secondary offects of phlebitis, the causes of which have, until lately, baffled every attempt to explain them, are principally concerned in bringing on the fatal termination of the disease. The deposits of pus in remote parts seem to arise from the passage of pus from the inflamed vein into the circulation, as is argued by Breschet, Andral, Dupuytren, and Cruveilhier.

Any extraneous substance in nature, introduced into the venous system, when it cannot escape from it by some of the emunctories, is apt to bring on visceral abscesses, completely like those which follow wounds, or surgical operations, and these abscesses are the result of *capillary phlebitis* in these same viscera.

If ink, or any stimulating substance, be injected into the femoral vein of a dog, in the direction from the heart toward the extremity of the limb, and the collateral veins should not convey the ink into the general circulation, so as to prove at once fatal, the limb in thirty-six hours swells, and if the animal be killed, small collections of effused blood are found in the cellular tissue and the substance of the muscles. The large veins are distended. with solid adherent blood; and the venous ramifications connected with the effusions of blood are also similarly filled, while the rest of the veins in the healthy parts are free from such coagula. Cruveilhier introduced a thin long piece of wood into the femoral vein of a dog down to the ham, and another piece upwards into the vena cava. Death followed on the sixth day. All the veins and venous branches of the lower extremities were filled with pus, and here and there were small abscesses. It is estimated by Cruveilhier, that the majority of persons who die of wounds, are destroyed by these internal deposits of pus. Velpeau, Marechal, and Cruveilhier, found pus, not merely in the inflamed veins, but in the right cavities of the heart, and in the centre of coagula of blood. Cruveilhier observed it in the lungs, liver, brain, spleen, muscles, and synovial cavities, without any manifest appearance of a general previous inflammation of those organs. The lymphatic vessels and heart were also similarly circumstanced.

Pus, circulating with the blood, is stopped in different parts of the capillary system: wherever this happens it gives rise to *capillary phlebitis*, or circumscribed inflammations, which rapidly lead to abscesses. The pus, like mercury, is most frequently stopped in the lungs; then in the liver or spleen; or it may produce circumscribed inflammations in any part of the body.

Why do not these multiplied abscesses of the viscera follow extensive abscesses of the common kind? why should it be a suppurating wound, that is generally necessary to bring on capillary phlebitis of the viscera? is there absorption of pus in the latter, and not in the former cases? The difference seems to be explained by the pus in one instance being acted upon and changed by absorption; while in the other it is formed in the veins, and is already in the circulation unmodified and unprepared by any previous influence of absorption on it. In France, phlebitis of the medullary texture of bones is found to take place with remarkable frequency after amputation, and to give rise to visceral abscesses.

Phlebitis is mostly occasioned by accidental wounds, or by those of venesection, amputation, and other surgical operations. A prick of the femoral vein in the operation for the cure of popliteal aneurism, has been known to bring on inflammation and suppuration within that vessel, extending thence to the external and common iliac vein and vena cava, so as to destroy the patient. The application of a ligature to the femoral vein in amputation, has also been followed by a fatal inflammation of that vessel, and of the external iliac vein, with traces of diffused inflammation up to the right auricle. It is true that the same consequences sometimes arise from amputation, when the femoral vein is not tied; but though the wound alone may excite the mischief, a wound and the ligature together, are much more likely to do so; and, on this account, all good practical surgeons make it a rule to abstain, as much as possible, from applying ligatures to veins. Numerous patients have died of phlebitis, brought on by the ligature of the vena saphæna major for the cure of varicous veins of the leg.

What Cruveilhier calls the *adhesive stage of phlebitis* is less dangerous than its other forms; the inconveniences of it are entirely local, merely those of obstruction of the vessel; and hence this pathologist regards uterine phlebitis in its early state, as more curable than has generally been represented.

The peculiar, œdematous, painful enlargement of the lower extremity, called *phlegmasia dolens*, sometimes occurring in women two or three weeks after parturition, frequently depends upon obstruction of the iliac veins, in consequence of the effects of inflammation. This fact was satisfactorily proved by Dr. Davis, of University College. In several women who had been afflicted with phlegmasia dolens, Velpeau also found the iliac and femoral veins full of pus. Sometimes, in women, who die shortly after childbirth, the veins of the uterus ovaries and the iliac veins, are the only ones containing pus; but sometimes, besides abscesses, in these vessels, there are others in the lungs, spleen, liver, muscles, synovial membranes, and various cavities, lined by a serous membrane. Puerperal fever itself is only the constitutional disturbance attending uterine phlebitis.

A colored engraving in Cruveilhier's great work on pathological anatomy gives a correct view of various circumstances characteristic of phlebitis. The patient from whom it was taken died of the consequences of that disease on the fifth day from its origin, after a gunshot injury of the biceps muscle, received about five weeks before the fatal result. The cephalic, basilic, ulnar, median, and radial veins, and their ramifications, are large, cylindrical, tense, and knobby, giving an appearance as if they had been injected with wax. Fig. 2, represents the veins opened: their coats are as thick as those of arteries. The cephalic vein is full of pus, as well as the median and radial veins. On the contrary, the basilic vein exhibits all the stages of phlebitis: thus its lower part contains pus; and its middle, a coagulum, in the centre of which is pus; while its upper portion is entirely filled with coagulum. In the substance of the deltoid muscle, may be remarked numerous small abscesses; some consisting of veins distended with matter, and others of pus effused around the ruptured veins. Two considerable abscesses were formed, one under the deltoid, and the other in the shoulder joint, which was completely full of purulent matter: both quite distinct, and without communication. As the original injury was in the centre of the biceps, this case proves the extention of phlebitis both upwards and downwards.

With respect to *the treatment of phlebitis*, in the early stage, leeches may be freely applied over the inflamed vein. Owing to the quickness with which the symptoms assume a typhoid character, venesection is not generally considered advantageous: it may however, sometimes, be tried at the commencement of the case. The limb is to be kept in a perfectly quiet state; and purgatives and antimonials may be prescribed. Fomentations relieve the pain; but, whether they are more effectual than cold applications in checking the inflammation is questionable. I should rely chiefly on calomel and opium, with local bleeding and fomentations.

When the vein becomes much distended, and pus is manifestly confined in it, the case should be treated as a common abscess, the matter let out, and a poultice applied. We know that, in such a case, the matter is bounded by the adhesive inflammation. Whatever treatment is chosen should be actively pursued in the beginning of the disease; for, after the formation of matter in remote organs, and after the commencement of the serious indisposition, resulting from such collections of pus, all prospect of recovery has vanished. Cruveilhier considers, that the treatment can only be successful in the stage of the coagulation of the blood, and that, when once pus has formed and entered the circulation, every plan fails.

Varicous veins or *varices*. A *varix* is usually described as a dilatation and thickening of a vein, which becomes at the same time elongated, tortuous, and knotty. It occurs chiefly where the blood has usually to ascend against its gravity. Thus the veins of the lower extremities are often the seat of varicous enlargements, with chronic thickening of their coats, and a tortuous knotty appearance. If every enlargement of a vein, whether attended with thickening of its coats or not, be regarded as a varix, then we shall have several varieties of the disease, as pointed out by Andral.

1. One is a simple dilatation of the veins, without any other particular change in them, but a lengthening and tortuosity, and may accompany the chronic inflammation of any organ. What Cruveilheir denominates *hypertrophy* of veins, differs from varices, inasmuch as these vessels are only enlarged, not diseased, nor imperfect; so that the blood flows well through them; but, in varices, the coats of the veins are diseased, and their channel more or less obstructed. They are dilated into little cells, in which the blood coagulates, fibrine is deposited, and in the centre of the clots there is sometimes osseous matter. Hypertrophy of veins is noticed wherever the regular or morbid nutrition of a part takes place, with increased energy, as is exemplified in the uterine veins during pregnancy, and in the growth of considerable tumors, fibrous, medullary, &c., in that organ. One cause of hypertrophy is an impediment to the return of blood.

2. Another dilatation of veins is attended with a thinner state of their coats, than natural, and it may be either an uniform or an irregular dilatation.

3. The third variety is dilatation, with thickening of the vessel, projections of certain points of it in the form of knobs, and a tortuous appearance of it.

4. In a fourth variety, septa or partitions are produced in the vein, whereby its cavity is divided into small cells, in which the blood accumulates and coagulates.

5. In the last form of dilated veins, besides these septa, there are irregular perforations in the veins, so that these vessels communicate with the surrounding cellular tissue, which is generally more or less diseased. This state is frequently exemplified in varicous veins about the anus, which receive the name of *piles* or *hemorrhoids*. Some hemorrhoids seem to be the smaller branches of the hemorrhoidal veins dilated, and forming tumors covered by the mucous membrane, skin, or the intermediate cellular tissue. Others

resemble dense cysts, containing a coagulum of blood, with lymph around it.

Some of the forms of varices here described, when situated in superficial veins, must necessarily render their valves inefficient; and, no doubt, these are frequently in a diseased state, and more or less destroyed, or impaired. In this state, they may even be concerned in producing an impediment to the return of the venous blood, and operate as a cause of the varicous dilatation. Frequently varicous veins seriously affect the capillary circulation in the lower limbs, so as to give rise to a tendency to chronic inflammation, followed by ulcers, which are incorrectly named *varicous*, and very difficult to heal. Varicous veins also frequently occasion a great deal of weakness and pain, the latter of which symptoms generally extends over a great part of the leg, and is remarkably severe. The diseased vein itself is also particularly subject to chronic imflammation, ulceration, and the consequent production of copious hemorrhage. It would be therefore incorrect to say, that varices are unattended with danger. Chaussier records an instance in which a pregnant woman died of hemorrhage from a varicous vein. Murat gives a similar case in a washerwoman. Velpeau, in 1819, saw a countryman die of the loss of blood, twenty-four hours after the rupture of a varix.

The veins, most liable to become *varicous*, are the great *saphænal* and its *branches*, the *spermatic*, and the *hemorrhoidal*. The disease rarely occurs in the veins of the lower extremities of very young persons; but, in the other veins, which have been specified, it often comes on at an early period of life.

Tall stature, and the large size and long perpendicular course of the veins, predispose to the disease, the commencement of which is often dependent upon constipation and a loaded state of the bowels, the pressure of the gravid uterus on the iliac veins, and sedentary occupations, and certain employments, in which the standing posture is long maintained without exercise. Any mechanical impediment to the return of the blood will bring on the disease. Hard drinkers are well known to be often the subjects of varicous veins.

In the *treatment of varicous veins*, one principal indication is to remove the exciting cause. Thus, in pregnancy, little effectual amendment can take place till after delivery. In every case, remove constipation; and when the disease is situated in the leg, a bandage, elastic-gum roller, or laced stocking, should be worn, and the limb kept as much as possible in the horizontal position.

When varicous veins are inflamed, leeches, fomentations, cold lotions, mild purgatives, quietude in the horizontal posture, and a temporary discontinuance of the bandage, until the inflammation ceases, and the patient can safely get up again, form the right practice. The inflammation of a vein, arising from a varix, is not commonly of that rapidly-spreading, and fatal kind, which I have described under the name of *phlebitis*. It extends rather to the skin, than to any considerable portion of the vessel.

When a varix bursts, and much bleeding comes on, cold applications, and, if necessary, pressure, are the best means of relief. When varicous veins of the leg are not relieved by pressure, rest, &c. and the severity of the case justifies the practice, the surgeon may try to obliterate some of the principal and most conspicuous of the diseased veins. The danger of the ligature, or even simple division, of the vena saphæna is now generally acknowledged. The division of its branches is not, however, so likely to be followed by such danger; a fact, adverted to by Sir Benjamin Brodie. Many individuals who come to hospitals with wounds in the leg must have varicous veins, yet such wounds rarely bring on phlebitis. Neither does the excision of varicous veins, forming piles, induce [this perilous consequence. When all the veins of the leg are in a state of morbid dilatation, and the distress is not restricted to any point, uniform pressure should be tried. When an ulcer was irritable, and difficult to heal, on account of its connexion with varicous veins, or when, without any ulcer, there was a painful varix, disposed to bleed, while the other veins were not the source of particular uneasiness, Sir Benjamin Brodie formerly applied potassa fusa, so as to make a slough of the skin and veins beneath it; but he found the practice objectionable, as leading to a tedious ulcer. The method is still, however, pursued, with some modification, by Mr. Mayo, who aims not at producing a slough of the vein, but only such a degree of inflammation in the portion of it adjoining the part of the skin, touched with caustic, as shall be followed by its obliteration with fibrine. In other cases, Sir Benjamin Brodie made an incision through the varix and skin, a method less painful than caustic, and the cut sooner healed than the ulcer left by the slough. Abandoning all these methods, he next tried the plan of dividing varicous veins and leaving the skin over them entire. Having ascertained the precise situation of the vein, or cluster of veins, he introduced the point of a bistoury through the skin on one side of the varix, and pushed it on between the skin and vein with one flat surface turned forwards, the other backwards. The cutting edge was then turned backwards, and the vessel divided by withdrawing the instrument. Moderate pressure was then made with a compress and bandage to stop the bleeding, and the patient kept in bed four or five days. Although this practice was not found so liable to excite phlebitis, as the division of a varicous vein and the integuments together, or the ligatures of the trunk of the vessel, Sir Benjamin Brodie informs me, that he now rarely or never resorts to it, as he finds that rest, bandaging, and other proper means obviate the necessity for it. In University College Hospital, the twisted suture has of late been tried in numerous instances as a means of curing bad varices of the lower extremity, and the ulcers connected with them. A steel pin, about three inches long, is thrust under each of the venous trunks adjoining clusters of the varices, until the point protrudes through the skin on theother side of the vein. Silk or thread is then tightly twisted round the projecting ends of the pin, and thus the vessel is constricted. The point of the pin is next removed with a pair of cutting forceps. Sometimes pins are thrust under the veins in this manner in several places, including the trunk of the great saphenal vein. I have known severe pain, abscesses, and erysipelas follow in some cases; and, in one of my patients, there was a fatal attack of phlebitis. I therefore recommend this practice not to be adopted, without some previous consideration of the kind of constitution which the surgeon has to deal with. Perhaps, also, the plan of introducing more than one or two pins at a time ought to be renounced, and care taken to withdraw all of them directly any unusual suffering begins to be experienced. The method also of removing them, as soon as ulceration commences, and not leaving them to make their own way out through the ulcerative process, seems entitled to commendation.

The varicous enlargement of the spermatic veins, called *cirsocele*, and that of the veins of the rectum, constituting *piles* or *hemorrhoids* will be noticed in our second section.

Venous aneurism, *aneurismal varix*, or *varicous aneurism*. This is a pulsatory swelling of a vein, arising from a preternatural communication, formed between such vessel and a neighboring artery. The situation, in which this peculiar disease ordinarily presents itself, is the bend of the arm, where it is produced by the unskilful performance of venesection, the lancet completely transfixing the median basilic vein, and piercing the subjacent artery.

The venous aneurism may occur, however, in any situation, where a large artery and vein lie near one another. Hence, examples of it are recorded by Larrey and others, in which the disease took place in the ham, thigh, and upper part of the arm, in consequence of gunshot and other wounds. When it arises from venesection, or a punctured wound, there are two wounds in the vein, and one in the artery, besides the puncture in the fascia. The external opening in the vein heals up, but the internal remains permanently open; thus allowing the blood to gush directly from the artery into the vein, which becomes dilated sometimes to the size of a pigeon's egg; the two vessels and intervening fascia becoming connected by the adhesive inflammation. However, instead of the artery, fascia, and vein, being always thus connected by the adhesive inflammation, so as to afford a direct passage for the blood out of the artery into the vein, an interspace is sometimes produced between the vessels by a part of the blood being effused in the cellular tissue, under the fascia, where a sac is formed; and this being placed between the two vessels, the blood is first discharged from the artery into it, and afterwards into the vein. It is to the latter form of the disease that Mr. Hodgson restricts the term *varicous aneurism*, while the case in which the blood flows directly into the vein, he calls *aneurismal varix*.

These modifications of the disease certainly appear to me sufficiently different to require different appellations; because one is really a false aneurism conjoined with a venous dilatation; and what proves the truth of this observation is, that the communication between the sac and vein may close, and then the aneurism of the artery takes its usual course.

In the museum of University College is a specimen of a varicous aneurism, with a bifurcation of the brachial artery high up the arm: it was taken from a subject, in whom the radial division was punctured in bleeding. It was a double aneurism, one being formed under the fascia, with a communication kept up between the arterial aneurism and the vein, through an opening in the fascia. The anastomosing branch, between the radial and ulnar arteries, is as large as either of them.

When the aneurismal varix arises from a gunshot wound, in which the ball has passed between a large artery and a vein, so as to open a direct communication between them, there is of course only one opening in the vein, and not two, as after venesection. A few years ago, I knew but of a single example of the *spontaneous* production of an aneurismal varix; and the case, which is related by Mr. Syme*, is a very remarkable one, for the aorta and vena cava communicated by a large aperture, a little above their bifurcation into the iliac vessels. Since then several other instances of the same form of disease have been recorded: one by Mr. Robinson, where an aneurism of the abdominal aorta communicated by two openings with the vena cava. The same gentleman, also, briefly alludes to an aneurism of the arch of the aorta, which was in St. Bartholomew's Hospital, and opened into the vena cava.† Another, by Mr. Perry, which I saw in the St. Marylebone Infirmary, arising from an opening formed between the femoral artery and vein; or rather, I should state, that at the spot in the thigh, where the communication had been presumed to exist between the artery and the vein, there was an aneurismal sac, about as large as half a walnut, firmly ossified within, which, by the pressure that it had exerted upon the vein, had caused the absorption of the coats of the latter, so as to form a circular opening about two lines in diameter, into which the aneurism had burst; thus producing a free and permanent communication between the vessels. The ligature was applied to the artery, but the patient died of hemorrhage on the sixth day after the operation. One circumstance, particularly explained by M. Breschet, as common in varicous aneurism, was noticed in this case, namely the remarkable thinness of the coats of the artery, which were scarcely thicker than those of a vein.* Dr. J. Proud Johnson, of Belmont, Shrewsbury, lately favored me with some account of a varicous aneurism in the leg, where "the internal malleolar branch of the anterior tibial artery was the chief cause of the venous sac anastomosing with the posterior tibial." If I understand Dr. Johnson's communication correctly, this example is unique, inasmuch as I know of no spontaneous aneurismal varix, arising from a communication between so small an artery as the internal malleolar branch of the anterior tibial, and a neighboring vein, which, in this instance, is stated to have been the internal saphœnal. Without having seen the parts, however, I can offer no positive opinion on the nature of the disease. At the same time, I trust that Dr. Johnson will take an early opportunity of publishing the particulars of the case, and a description of the disease, as it appeared on dissection. It was a case of spontaneous formation. The patient was afflicted with scrofula and epilepsy. The limb was amputated. The patient has recovered from the operation, the fits have left him, and his general health has improved.

---

* Edinb. Med. and Surgical Journal, vol. xxxvi.

† Lond. Med. Gazette, vol. xiv. p. 462.

In the common form of the aneurismal varix, a communication is established between the median basilic vein and the brachial artery. The consequence is, that the vein becomes large and tortuous. The tumor gives a jarring thrilling sensation to the hand which examines it, and a peculiar hissing sound is heard, when the ear is applied to the part. After the swelling has attained the size of a pigeon's egg, it usually becomes stationary. If the artery be compressed above the swelling, the latter becomes flaccid, and the blood may be pressed from it. In general a slight weakness of the arm is the worst effect of the disease. Sometimes, however, it becomes cold from the want of its usual supply of arterial blood, a great part of which, instead of proceeding to the forearm, flows at once into the vein, and is carried back to the heart again. Hence, there is only a weak pulse at the wrist: but the brachial artery, above the tumor, is larger than natural, and pulsates with uncommon force. The observations of Breschet prove, that some of the venous blood passes into the artery, the coats of which gradually undergo such a change, that they are more like those of a vein than of an artery.

A case of this description was brought to my house a few years ago. The patient was a washerwoman, who had imprudently allowed some unprofessional person to bleed her. The hissing noise, thrilling sensation in the tumor, and vibratory motion in the adjoining veins were well exemplified. As the case was recent, I recommended pressure, and as the woman did not continue her attendance long, I conclude that she was either cured, or so far relieved, that the inconveniences of the tumor were not very great to her. In general, the aneurismal varix requires no operation, as it becomes stationary, and does not produce any severe annoyance. But if it were to be conjoined with an aneurismal sac between the two vessels, so as to constitute what Mr. Hodgson proposes to call the *venous aneurism*, then an operation might become necessary in the event of the sac showing a disposition to enlarge and become troublesome. Here, the right practice is to tie the artery above and below the opening in it; for Dupuytren refers to no less than three examples, in which the application of one ligature did not cure the disease. We should not, however, resort to the operation without a real necessity for it, because in one instance, the particulars of which were given me by Mr. Atkinson of York, it proved fatal, the limb having mortified; and such was also the result of the case from which a preparation at University College was taken. The ligature of the femoral artery in Mr. Perry's case, as already stated, was followed by hemorrhage on the sixth day after the operation: whether the alteration in the texture of the artery in this disease would generally create an increased risk of this event, future experience must determine.

---

* Perry, in Med. Chir. Trans. vol. xx.

In the early stage, pressure, by means of a graduated compress, is the right treatment, or else with an instrument calculated to compress the swelling, as was once successfully employed by Sir Astley Cooper, in the case of a young lady who had this affection. In the museum of the University College, is a specimen of varicous aneurism presented to it by Mr. Oldknow. Pressure was made on it with an instrument; the tube of the vein obliterated; and the puncture in the artery closed: the remains of a sac between them is evident.

DISEASES OF BONES.

In noticing the question how far lost substances, or portions of the human body can be reproduced, I explained, that the osseous texture is one of those in which the greatest power of regeneration is exhibited. In all general circumstances, the texture of bones resembles that of other organised parts of the body, being supplied with arteries, veins, absorbents, and nerves. Its chief peculiarity is that of containing the phosphate of lime, which communicates to it that rigidity, strength, and solidity, so essential to the purposes and uses of the various parts of the skeleton. The changes which the bones undergo in the commencement, progress, and decline of their diseases, are generally marked by a slowness of character, much more remarkable than what attends the processes of disease in the soft parts. We have seen an analogous circumstance in relation to the cure of fractures, as compared with the cure of wounds. No doubt, these facts are connected with the introduction into the osseous tissue of the lifeless inorganic calcareous matter, which I have specified, and perhaps, also, with the inferior supply of nervous energy in the bones at large. Under such circumstances, we should not have expected, that the bones would be endued with even a greater power of repairing the losses and injuries which they suffer from disease, or accidental violence, than is manifested in any other texture of the body. For this purpose, however, it is their nature to require time,—frequently a considerable time.

One remarkable circumstance, ascribed to the peculiar vital properties of bone, is that its injuries and diseases generally affect the constitution much less than those of soft parts*: we know, that the severe effects of certain fractures truly depend, not on the injury of the bone, but on the manner in which they are combined with other mischief done to the soft parts, or the important organs, which the bones support and protect.

Inflammation of bone, termed ostitis, may be either *acute* or *chronic; simple* or *specific;* either produced in a single bone through some local impression, or in several as the result of a general disposition to inflammatory enlargement in the osseous system. Pathologists distinguish inflammation of the periosteum and medullary membrane from that of the proper osseous tissue; for each of these membranes is liable to be attacked with inflammation independently of the bone; though it is true, that it sometimes extends to them from the osseous tissue itself, when this is primarily affected.

It has been well explained by Mr. Stanley, that a constant correspondence may be remarked between inflammation of the medullary membrane, and of the periosteum, and of the substance of the bone itself, so that it is difficult on looking at a bone, in which there has been for some time a diseased process carried on, to determine in which tissue the affection first commenced, and the order in which it has supervened in the others. For instance, if an abscess form in the medullary tissue, the irritation is speedily propagated to the corresponding part of the periosteum, in which ulceration may occur, or suppuration take place between it and the bone. So, also, venereal nodes, beginning with inflammation of the periosteum, soon produce irritation of the bone itself, causing increased thickness and density of its walls, and sometimes even obliteration of its medullary cavity.†

In *chronic* cases, the enlargement or swelling comes on with remarkable slowness, and the hardness is quite incompressible. The pain is also subject to variety; for, when the case arises from an accidental blow, the pain may be inconsiderable, and unaccompanied by any constitutional disturbance; but when a bone inflames, in consequence of syphilis, the abuse of mercury, and other causes extending their influence throughout the system, the pain is often remarkable for its severity, and its periodical exacerbations, which usually come on in the night.

---

* E, Stanley, in Med. Gaz. vol. xx. p. 421.

† Id.

Inflammation of a bone sometimes produces an enlargement of it, by what is termed interstitial deposit or by the deposit of an extraordinary quantity of the phosphate of lime in its texture. Frequently, however, instead of having the latter effect, it produces an absorption of the calcareous matter, so that at the same time that the bone is enlarged, it becomes porous and lighter than natural; its surface presenting numerous foramina, occasionally described as apertures through which the vessels of the inflamed bone took their course.

Scrofulous inflammation of a bone does not make it more solid or heavier, but the reverse. On the contrary, in syphilis, the enlargement of bones may be attended with increased weight of them.

Inflammation of bones often renders their surface rough; we see this effect produced both by syphilis and scrofula, though with a diversity in the appearances.

The following are described by Mr. Mayo, as the different appearances, found on making sections of inflamed cylindrical bones:— 1. A growth of porous bone, superimposed upon the cortex. 2. A growth of compact bone in the same situation. 3. An expansion of the cortex through its conversion into porous bone. 4. An expansion of the cortex through its apparent separation into an outer and an inner layer, with porous or cancellous structure between them; or the expansion consists of an outer part, compact; an inner part, porous. 5. Expansion of the cortex, with compactness of texture throughout. 6. The medullary cavity more or less diminished, either by the encroachment of the cortex inwards, or through the solidification of the cancellous structure.*

While either a slow enlargement, with increased weight and solidity, or a porous alteration of structure and caries, attended with greater lightness, and a loss of the phosphate of lime, are not unfrequent consequences of chronic inflammation of bones, ***suppuration in the medullary texture***, and mortification, or ***necrosis***, are more commonly the effects of acute inflammation of the osseous texture, or injury of the medullary part of the bone. This statement is liable, however, to exceptions; for, in persons of a scrofulous constitution, a slight disturbance in the nutrient processes of a bone by a trivial blow, or exposure to the influence of a damp cold atmosphere, will bring on suppuration in the cancellous texture.

It is only the cancellous texture, or medullary cavity of a bone, that is liable to suppuration; or, at all events, suppuration cannot take place in the solid parts of a bone, unless their tissue be previously expanded and loosened by the effect of chronic inflammation. Whenever a bone suppurates, there is generally more or less absorption of it; and sometimes while the interior texture is removed by the absorbents, so as to leave a considerable cavity, the external shell is expanded, constituting the case technically named *spina ventosa*. Many inflammations of bone, followed by caries, or necrosis, and by separation of the periosteum originate from inflammation, disease, or injury of the medullary membrane. At length the matter makes its way under the skin, by causing the absorption of parts of the most superficial side of the bony cavity; then a soft swelling and fluctuation occur; and the abscess in time bursts, attended with great diminution of suffering.

---

* Mayo's Pathology, p. 28.

A collection of pus may continue, however, for a surprising length of time, within the texture of a bone, and keep up very perplexing symptoms. In one of the volumes of the London Med. Chir. Trans., there is a paper by Sir Benjamin Brodie, on small abscesses in the cancellous structure of the tibia, attended with enlargement of the bone, which continued for many years to distress the patient, until the matter was discharged with the trephine. In the writings of the late Mr. Hey, are some other cases of this kind, which were treated in a similar way. When a cavity, or cyst in a bone is full of purulent matter, the making of a prompt and free outlet for it is generally the principal indication; but this rule is not always applicable, where the matter is the product of a specific disease, as such operation would often render the patient's condition worse.

With respect to the osseous cysts, termed by the older surgeons, *spinæ ventosæ*, their formation, perhaps, cannot always be referred to the mechanical expansion of the bone; or, at all events, while absorption is going on inwardly, increased deposit is taking place outwardly. Hence, as Mr. Stanley observes, the bone is sometimes increased in size. In some instances the walls of the cyst are not thicker than paper; in others, they are fully an inch in thickness. In the former case, the tumor may present a sensation to the touch, compared to the crackling of parchment; in the latter, the feel of a solid bony swelling, or exostosis. The contents also vary, being either a serous or purulent fluid, or the products of specific disease, as scrofulous, or medullary matter.

Acute inflammation of bone, taking place as an effect of idiopathic periostitis, requires leeches, fomentations, poultices, calomel, and opium, saline purgatives, and other antiphlogistic means, including quietude and low diet. When the inflammation is chronic, the treatment must be chiefly regulated by the consideration of its cause, whether syphilitic, scrofulous, or the joint effect of mercury, cold, excesses, and irregularity of diet and regimen, and an impaired constitution. I believe, that we do not frequently meet with nodes in syphilitic patients, unless these individuals have been using mercury in an injudicious manner, that is to say, irregularly or immoderately, and without keeping themselves in a proper uniform temperature at home, during the mercurial course. Under such neglect, the united influence of the original disease, and the mercury itself on the constitution, thus unfairly dealt with, seems to produce a considerable tendency to inflammation of the periosteum, or even of the osseous texture itself. Hence nodes, caries, and necrosis, as complications of the venereal disease.

Simple absorption, or removal of *bone*, unattended with any formation of pus, or inchorous matter, should be discriminated from *caries*, as it is completely a local affection, caused by the pressure of aneurisms, and other swellings on the osseous texture. It is sometimes accompanied with an effort on the part of nature, to repair the injury of texture; for which purpose, she throws out new bony matter near the chasm that has been produced.

Caries or *ulceration of bones.* Some years ago, *caries* and *necrosis* were not duly discriminated from one another, though the former is as different from the latter, as *ulceration* of the soft parts is from *mortification*. While *caries* is one of the consequences of an inflamed or irritated state of a bone, some of whose textures becomes absorbed, so that a chasm is produced in it, without its vitality being destroyed; *necrosis* is another condition, involving the complete or partial death of the original bone, and often followed by the formation of a new one, or by the more or less complete repair of the part that has been destroyed.

The points of resemblance between *caries* of bones and *ulceration* of soft parts are striking. Each affection is preceded by *inflammation;* each is attended with the *formation of matter;* each may be followed by the *production of granulations;* each may arise from *local* or *constitutional causes;* and each may be combined with the total extinction of vitality in certain points of the textures affected. Thus, precisely in the same way, as we often see ulceration and sloughing exhibited together in the soft parts, we also frequently find *caries* and *necrosis prevailing together* in the bones. Some portions of the osseous texture seem to perish, and to be detached from the living parts of the bone, while, in other places, caries is making its attack and producing its usual effects.

The venereal disease is sometimes a cause of caries, but more frequently of necrosis; and very often of both affections together. On other occasions, it leads to the production of nodes and other changes in the osseous system hereafter to be considered.

The bones are all liable to caries, though the soft or spongy portions of them are most commonly the seat of it, especially the bodies of the vertebræ, the sternum, the upper heads of the femur and tibia, and the bones of the pelvis, tarsus, and carpus.

Sometimes the disease may be traced to the effect of local injuries, followed by considerable inflammation and abscess; but it is still more commonly seen as the consequence of scrofula and syphilis. In whatever manner occasioned, it is at first attended with some pain in the bone, and inflammation and swelling of the neighboring soft parts. Generally, an abscess of a more or less chronic nature is formed over the diseased bone, breaking and discharging a thin ichorous bloody matter, of a peculiarly offensive smell. The integuments around the opening, assume a dark, unhealthy livid tinge. If a probe be introduced, the surface of the bone will be felt to be rough and bare, and if the disease be seated in the head of a bone, a probe will sometimes pass into the cancellous texture, without any material resistance. There is a softening and partial absorption of the bony texture, some of which crumbles away on the slightest touch.

The disease is accompanied by the production of pale fungous granulations, and the discharge of a thin, fœtid dark colored, or bloody matter, which blackens a silver probe. The aperture, formed in the skin, does not heal, but becomes what is termed a *fistula*, through which the matter, and sometimes little particles of the diseased bone, find their way outwards.

The *worm-eaten caries*, as it is called, which perforates a bone at innumerable points, and in an infinite number of directions, and which used formerly to be so common in syphilis, as then treated, would appear to begin with disease and suppuration in the diploe, the worm eaten appearance being afterwards caused by the pus causing numerous apertures to be formed in the skull for its escape.

Around the carious part of a bone, from scrofula, may frequently be noticed new bony deposits, in the form of spiculæ, or tubercles and projections, sometimes extending to a considerable distance from the diseased joint. These productions may be the result of periostitis. As Mr. Stanley observes, generally around an ulcer in bone, there is found a heaping up of osseous matter, proportioned to the activity of the process, and analogous to the thickening, which occurs around an ulcer in soft parts. This fact is well represented in one of Weidmann's excellent plates. Its presence Mr. Stanley considers to be characteristic of the inflammation by which the ulcer was formed; for a similar thickening and increased density is believed by him not to exist around bone, which has been progressively absorbed in consequence of the pressure of a tumor; nor around some specific ulcers of bone, as those occuring in scrofula, syphilis, and lupus. With respect to scrofulous disease of bones, however, nothing is more common than the rough deposits in its vicinity, which I have described, and of which there are several fine specimens in the Museum of University College. The bone in the immediate vicinity of a carious part of it, if injected, appears to be exceedingly vascular.

Caries may occur at any period of life; but is most frequent in young subjects. This fact may admit of explanation by the consideration, that scrofula, which is one of the most common causes of caries, principally affects children and young persons. Syphilitic caries, and caries from the effects of external injuries, are met with in individuals of every age.

The *treatment of caries* is to be regulated by the view entertained of its causes. If the disease should have arisen from a local injury and have followed the inflammation and suppuration resulting from the violence, without being accompanied by any marks of general disorder of the system, any traces of syphilis, scrofula, or scurvy, we should then be justified in regarding the affection of the bone as completely local. In the early stage, we could only employ such treatment as the state of the soft parts might require; generally antiphlogistic treatment until the inflammation had subsided. Afterwards, we should aim either at removing the carious portion of bone, or at stopping the morbid action, in which caries consists, and exciting such a change in the bone, as will lead to a cure. Mr. Stanley lays it down as a remarkable fact, however, that, after ulceration of the osseous tissue, or caries, as it is termed, the lost bone is never reproduced. The utmost reparation, he finds, is the cicatrization of the parts around it. In ulceration penetrating the shaft of the tibia, however, he has seen the vacancy filled up by a gristly substance, with osseous points scattered through it, but never sufficiently to render it a mass of bone. In the cure of caries of the vertebræ, the deficiency is not filled up with new bone, but the surfaces, above and below, approximate and unite.

With respect to the removal of carious portions of bone, the practice is sanctioned by some surgeons of eminence, who think that more good may be done in a few minutes by cutting instruments, than will generally be accomplished in as many years by nature, even when aided by medicines and local applications. This is sometimes true; for, even when the disease arises from constitutional causes, and requires internal remedies, accordingly, such remedies may stop the progress of caries, but are frequently quite inadequate to bring about a new healthy action in the part, sufficient to lead to a cure: this, however, is not always the case. The caries produced by syphilis, and scurvy, may be completely stopped, and cured by remedies adapted to those particular states of the constitution. And even the caries arising from scrofula, though less under the control of internal medicines, may sometimes be checked by counter-irritation, and the administration of iodine, iodide of potassium, the sulphate of quinine, steel, and other medicines required to amend the state of the constitution.

Caries, resulting from local causes, accidental injury, &c. may also get well, without any occasion for the excision of the diseased portion of bone.

But when caries presents no reasonable prospect of cure by any internal plan of treatment, and the part is so situated as to admit of removal, the indication is clear. The requisite denudation of the diseased part of the bone is to be made, and the disease either cut or scraped away. Sometimes, however, instead of this practice, we may try the plan of exciting a new action in the carious part by dressing it with a strong solution of nitrate of silver, or the diluted nitrous acid. Setons, issues, or blisters, near carious bone, are frequently of great service.

Necrosis is the death of a portion of bone, sometimes of the greater part of it; for, not unfrequently, the whole shaft of one of the long cylindrical bones is destroyed. Generally, however, the head of the bone escapes; the articular parts are spared; and, when the new shaft is formed, the original portions left, which are commonly the ends of the bone, become grafted, as it were, on the new osseous case.

After a portion of a bone has perished, or fallen into the condition of necrosis, its detachment and removal becomes as necessary for the process of reparation and the cure of the patient, as the taking away of any other extraneous substance lodged in the body, and keeping up irritation, suppuration, and other effects; indeed, the dead bone is to be now regarded as an extraneous substance, and its removal from the part, either by the action of the absorbents*, or some other natural process, or by surgical proceedings, is absolutely necessary. It matters not, so far as the nature of the disease is concerned, whether merely one layer of the bone is affected with necrosis, or the whole substance of it—the disease is still essentially of the same kind; and the various circumstances of depth and extent, to which the disease may have proceeded, relate only to its severity. In this point of view, they certainly are of great importance in respect to the prognosis, the prospect of cure, and the length of time which will necessarily elapse before this desirable event can be accomplished.

While *caries* mostly affects the spongy parts of bones, and those bones which are of a light texture, *necrosis* is found to attack principally the harder parts of bones, and those bones which naturally contain the greatest quantity of phosphate of lime, and are of a firm compact texture; and this is so much the case, that those circumstances, which would produce necrosis in the harder parts of bones, seem mostly to cause caries when they exert their operation on the softer spongy parts of the skeleton. Among the bones most frequently attacked by necrosis, I may mention, first, the tibia, then the femur, the lower jaw, the clavicle, the radius, and the ulna. The bones of the cranium are also frequently the seat of necrosis. Of all the bones, none so frequently suffers from necrosis as the tibia. The disease is one to which both sexes are liable, and this at any period of life; yet we find, that the disease is more common in children and young persons, and especially in those of scrofulous constitutions, than in other individuals. But this observation must be received with one qualification, namely, that all persons who are exposed to dangerous and laborious employments, or whose pursuits render them liable to suffer from accidental external violence, are frequently the subjects of necrosis, and this, whatever may be their age or the nature of their constitutions.

---

* In cases of necrosis, "the whole of the old bone, *provided it be not exposed*, is carried off by the absorbents, into the system," &c.—Marcartney on Inflammation, p. 41. This is the common doctrine. On the other hand, Mr. Gulliver is led to believe, that "if a piece of bone, truly dead, be inclosed within a new osseous cylinder, then it is indeed a bad case of necrosis, which the patient will carry to the grave with him, unless relieved of the sequestrum otherwise than by absorption." (See Med. Chir. Trans. vol. xxi. p. 6.) The experiments and preparations, on which this inference is founded, are admitted, however, by Mr. Gulliver himself, not to amount to a peremptory proof of the impossibility of the absorption of dead bone. (*Op. cit.* p. 18.) I have attended so many patients, in whom the sequestrum has ultimately disappeared, that either its absorption, or dissolution, seems to me a fact admitting of no dispute, difficult and slow as the change frequently is.

Although the most extensive forms or degrees of necrosis are chiefly seen in the long cylindrical bones, we do also sometimes meet with them in the flat ones; and even the short thick bones are occasionally quite destroyed. I have, indeed, already explained, that the bones of the cranium are not unfrequently the seat of the disease, and that the lower jaw is often affected. In the records of surgery, many instances are given in which the scapula was attacked. Cases do sometimes happen, but they are uncommon, in which the articular parts of bones are destroyed, or involved in the mischief of necrosis; and, then, as the shaft is more or less destroyed at the same time, the prognosis is generally unfavorable, and amputation of the limb can scarcely be avoided.

Every thing affecting the periosteum, the substance of the bone, or the medulla in such a way as to interrupt the nutrition of the bone, may conduce to the origin of necrosis. The causes, therefore, of necrosis, may be divided into *external* and *internal*. The *external causes* are principally severe contusions, bad compound fractures, the pressure and irritation of foreign bodies in the substance of the bone itself, or in its cancellous structure, (the lodgment of a musket-ball there, for example, may produce necrosis,) the long-continued exposure of the surface of a bone deprived of its periosteum to the air; or the irritation of it with acid or caustic applications will produce a similar effect. Thus sometimes the free use of strong concentrated acids in the treatment of sloughing ulcers on the shin will, if care be not taken, produce necrosis of the tibia. In University College Museum is a necrosis of part of the cranium from a burn.

The general rule, when the walls of a cylindrical bone perish in their whole extent, the medullary texture suffers with them; but, Mr. Stanley refers to a remarkable exception, in which, in consequence of the application of nitric acid to a phagedenic ulcer, the whole of the periosteum, covering the tibia, became inflamed; the walls of the bone perished; but the medullary texture escaped.*

Whenever the old surgeons saw a portion of bone exposed to the atmosphere, and deprived of its periosteum, they concluded that a cure was impossible without exfoliation of the part of the bone thus uncovered; they fancied that it would of necessity become attacked with necrosis, and thrown off from the living part of the bone before a cure could be accomplished. But this was taking an erroneous view: it does not follow, that a bone must die and exfoliate under these circumstances. It is true, that if the bone has suffered much contusion, if the patient is old, feeble, and unhealthy, and, especially, if the exposure has been long continued, necrosis will most probably take place. But former practitioners were confirmed in their erroneous opinion by invariably committing two errors in the treatment of these cases; in the first place, they did not take care to cover the exposed portion of bone as quickly as possible with the soft parts, which had been detached from them, and thrown back in the form of a flap; and, in the second place, they commonly dressed the wound with irritating applications, and with what they conceived was calculated to promote exfoliation. Such practice would of course tend to confirm the view which they had taken of the case; for, under the kind of treatment referred to, necrosis would be almost certain to follow: whereas, if they had promptly covered the exposed bone with the soft parts, and had then resorted to proper dressings, they would soon have discovered, that the simple exposure of the surface of a bone is not necessarily followed by necrosis; and that exfoliation is not always to be apprehended as a matter of certainty. We know that the osseous texture does not depend entirely on the arteries of the periosteum for its nutrition; and that those of the medullary membrane are materially concerned in this function; hence, it does not follow, that a bone must perish, because it is deprived of its periosteum. On the contrary, if the patient be young, and his constitution sound; if the bone be not too much contused, and not kept exposed too long to the atmosphere, or dressed with improper drying, astringent, spirituous applications; the production of necrosis may generally be avoided. All this implies, however, that the violence which has given rise to the accident, has not operated too much on the medullary texture. When a limb has suffered such a degree of injury, that the periosteum is detached from the surface of the bone, along with the soft parts, an injudicious method of proceeding will of course bring on necrosis of the exposed bone; but, if the loosened flap of soft parts be immediately laid down again, and no stimulant applications be used, there may be no necrosis at all, and, of course, no exfoliation; granulations will spring up from the surface of the bone; these will unite to those arising from the soft parts, and a complete cure will often follow with extraordinary expedition, particularly in young and healthy subjects.

---

* Med. Gaz. vol. xx. p. 498.

But necrosis, and the worst forms of it, may proceed from *internal causes*, or from such as affect the bone, through the medium of the constitution. Experience proves that necrosis may follow that deranged and debilitated state of the system remaining after various kinds of febrile disturbance. The origin of some of the worst cases of necrosis may be attributed to the debilitating effects of typhus fever, small-pox, or measles. Scrofula, lues venerea, scurvy, and the prejudicial influence of a badly conducted course of mercury, have all been known, under particular circumstances, to excite necrosis. When mercury gives rise to this affection, it is generally when that medicine is administered for the cure of syphilis, and the patient does not, during such mercurial course, take proper care of himself, being exposed to the vicisitudes of the weather, or incautious in his diet. In many instances, the mischief is brought on by the mercury being given in excess, or by small quantities acting with unusual violence. The bones which most frequently suffer under these circumstances, are the lower jaw, and part of the alveolar processes of the upper jaw. Necrosis and abscesses are frequently combined together; we sometimes find matter on the surface of a bone, part of which has perished; but the latter circumstance is usually in consequence of the very inflammation which gave rise to the abscess, having extended its effects to the bone itself; the bone, therefore, suffers from the same causes as produced the suppuration. It is, however, possible to conceive that an abscess may produce necrosis, when its pressure operates upon the bone in an extraordinary degree; then, indeed, it is possible that necrosis may be occasioned by an abscess, but certainly not by any corrosive qualities of pus.

The symptoms of necrosis vary in different cases, according to the extent of the disease and the nature of its cause. When it is of limited extent, that is, when it is merely superficial, not extending deeply into the bone, and arises in consequence of external violence, the symptoms will not be very different from those of a common phlegmonous abscess. Suppuration occurs in the soft parts, and, as soon as the matter is discharged, if a probe is introduced, the bare bone is felt. In such a case, unless there be an extensive and violent inflammation of the soft parts, there may be little or no constitutional disturbance; but when the necrosis is more considerable, and the soft parts are more extensively implicated either primarily or secondarily, in the disorder, then there will be a greater, and sometimes a violent derangement of the system. But there is a form of necrosis—one, in which the patient is generally young and of a scrofulous habit of body, and in which the bones of the carpus, or tarsus, or the phalanges of the fingers suffer. In such cases, an indolent swelling first forms, unattended with much pain or disturbance of the system; at length a fluid collects in the part, which bursts and pours out an ichorous matter. In this stage, if a probe be introduced, we may feel the bone to be bare and rough—in fact, it is already in the state of necrosis. It is chiefly in individuals, thus predisposed to the disease, that we also meet with those formidable examples of necrosis, in which the whole shaft of a long cylindrical bone perishes. In scrofulous or syphilitic persons, on the application of some exciting cause, the death of the whole shaft of a long bone, or a considerable portion of some other bone, frequently occurs. When the disease arises in individuals, whose state of constitution promotes the origin and wide spread of disease in the osseous system, necrosis generally begins with a deep-seated and excruciating pain in the limb, followed by a general swelling, involving the whole of that part of the member, and mostly including also the two nearest joints. It is, however, much greater about the centre of the limb than elsewhere; and one of its characters is, that it seems to have no definite boundary, presenting every where a remarkably firm unyielding feel. The patient experiences no alleviation of his sufferings till matter forms and the abscess bursts, and then there is generally some diminution of the pain; but it is found that, on the escape of the matter, the tumor does not subside in the degree usually remarked in a common abscess under similar circumstances; there still remains an immense swelling, which is of a firm unyielding kind, depending upon the great quantity of coagulating lymph effused around the dead bone, the thickened state of the periosteum, and the œdematous state of the cellular tissue. These circumstances explain why there is but little subsidence of the swelling immediately after the matter has been let out, or found an outlet for itself. If a probe be introduced after the bursting of the abscess, it passes onwards till it is stopped by the bone, a portion of which may often be felt to be bare and rough. In all these cases we should let out the matter early, for the sooner this is done, the sooner will the patient experience a diminution of the agony attending the confinement of deep-seated matter. After the abscess has made its way out, or been discharged by puncture, the opening or openings (for there are sometimes more than one) will not heal up very speedily; in fact, they are converted into fistulæ, and losing all disposition to cicatrize, they emit fungous granulations around their orifices. The indisposition of these fistulæ to heal, however, does not usually depend upon any other impediment than the presence of the dead bone in the limb, the *sequestrum*, which, in the manner of an extraneous body, keeps up irritation and suppuration. Hence, nature seems to maintain the fistulous apertures, in order that whatever pus is formed may flow out, and sometimes as experience proves, for the passage of the dead bone itself. In consequence of the presence of the sequestrum and the long-continued suppuration thereby produced, the sympathetic inflammatory fever, which attends the first stages of an extensive necrosis, is soon converted into a febrile disturbance of the hectic type; indeed, the disease generally goes on so long, and the discharge sometimes continues for such an indefinite length of time, that the constitution may be reduced to the lowest state of weakness; and, in addition to the hectic, there are occasional attacks of irritative fever, by which the patient is brought into great danger, such danger as admits of no means for its removal, except an operation for the extraction of the sequestrum, the cause of all this suffering and peril; or if the disease be not in a state for such proceeding, we may be called upon to perform amputation of the limb, in order to save the patient's life. Before we can say positively that necrosis exists, it is necessary to introduce a probe, for until we can touch a portion of dead bone, we cannot be certain that the disease has occurred. Sometimes, however, when the dead portion of bone lies superficially, we may actually see a part of it within the fistula, or at the bottom of an ulcerated chasm.

The color of a sequestrum is not always the same; it is often perfectly white; and when a portion of bone is whiter than natural, we may be sure that it is in the state of necrosis. Generally when the dead bone has been exposed for some time to the air, it becomes brown or black, and every body knows, that a bone with this appearance has perished. In particular instances, where the whiteness is not much increased, there may be doubt; but if a brown tinge be seen upon the exposed bone, we may conclude that it is dead. Excessive whiteness, or a darker color than natural, is a sure indication of necrosis. When a sequestrum lies deeply, and is not exposed to the air, it is generally white, or of a light brown color; but when it has been exposed for some time to the atmosphere, or remained long at the bottom of an open ulcer, it assumes a darkish, or even a black hue.

The process of *exfoliation*, or that process by which the dead portion of a bone is separated from the living portion, has a considerable resemblance to the process by which sloughs of the soft parts are thrown off; especially this will seem the case, if we make due allowance for the greater slowness with which all changes in the bones are carried on. In making an issue, the first step is to kill a portion of the skin. Very soon increased vascularity of the adjacent skin is noticed, and a red line forms immediately around the eschar. And so it is with bone; the parts, surrounding the dead portion, directly become preternaturally vascular, or (to use Hunter's expression) inflamed.* A groove is next formed all round the sequestrum, which is generally believed to be produced by the action of the absorbents of the adjoining living bone, or, as Mr. Hunter first demonstrated, the groove is formed by the absorption of that part of the living bone which is contiguous to the dead; its earthy matter being first taken away, and then its animal part. The groove begins on the surface, and extends gradually more and more deeply, until the dead portion is completely undermined and detached; in this respect, we recognise also a correspondence to what happens in the separation of sloughs. As the groove deepens, it is occupied by granulations arising from the living bone; and hence, as Mr. Stanley observes, on removing the sequestrum, we see next to it, not the surface of the living bone, but a layer of vascular granulations. And, in correspondence with the granulations that have sprung up from the living bone, there is the well-known rough surface of the dead, with its multitude of prominences and excavations, fitted to the granulations, which, as it were, push out the dead bone from the cavity in which it is lodged. In the course of time, a sequestrum may be reduced to an inconsiderable size, compared with what it was originally, the greater part being removed, and unless the portion that is lost undergo some unexplained kind of dissolution, as suspected by M. Velpeau and others, or come away in minute particles with the discharge, I know of no agents for the production of this change, but the absorbents. At all events, whatever may be the inability of the absorbents to remove *a loose* and *perfectly separated piece of dead bone*, experience furnishes very convincing proofs, that dead bone may be absorbed *while retaining its connexion with the living bone.*[*] In University College hospital, I have repeatedly noticed the disappearance of portions of dead bone, which had been plainly felt in wounds and ulcers for several weeks, and interfered with the healing process.

---

* E. Stanley, Med. Gaz. vol. xx. p. 498.

In the earlier stages of the necrosis of the shaft of a long cylindrical bone, the periosteum (if spared), in the neighborhood of the portion of bone about to be destroyed, always becomes thickened and more vascular than natural, and continues in this state during the formation of the substitute for the old bone; but as soon as this process is finished, and particularly after the detachment of the sequestrum, the periosteum returns to its natural condition, and loses its increased vascularity; its inner surface has no longer the pulpy, granular, highly vascular texture which it had in the early stages of the case, when the office of producing the new bony formation round the sequestrum devolved upon it. After the sequestrum has been completely loosened, it still remains at the bottom of the abscess or ulcer, and within the new bony case, and would sometimes continue there a considerable time, keeping up pain, irritation, and discharge, were we not to introduce forceps and remove it, and even to make such incisions for the purpose, and such removal of a part of the new deposit of bone as may be requisite. Occasionally the sequestrum is not only perfectly loose, but so superficial and exposed, that it can be taken away without any occasion for the knife, trephine, or saw. When an abscess, ulcer, or fistula is complicated with dead bone, it is a rule in surgery always to remove the sequestrum as soon as possible, that is, directly it is loose, and for this purpose to practise such operations as may be necessary. But not only is the sequestrum often loosened and thrown off from the living bone by spontaneous or natural processes, (and I have seen several cases in which considerable portions of the shafts of the humerus and femur have been thus detached, coming out through the integuments without the aid of any formal surgical operation,) not only does nature effect all this, but, when the entire shaft of a bone has been destroyed, she makes wonderful, and generally most successful efforts to form a new bone, that answers almost as well as the original one. When the shafts of the tibia, humerus, femur, or other long cylindrical bones are destroyed, and nothing of the original bone remains alive, except the articular extremities, even when the destruction has proceeded to this extent, nature will form a new bone, and the uses of the part or limb will be restored. In the sides of the new bony formation are openings, termed the *cloacæ*, which serve for the escape of the matter secreted in the interior of the new bone, so long as the sequestrum keeps up irritation there. The cloacæ, in many instances, take an oblique course, and do not pass straight and direct into the cavity of the osseous tube. They mostly have an oval or a round shape. Sometimes, however, they do pass direct into the cavity of the new bone, a fact not agreeing exactly with Weidmann's description. No doubt, the straight direct course of some cloacæ is an exception to the general rule.

---

[*] E. Stanley, Op. et. vol. cit. p. 499.

The flat, as well as the cylindrical bones, when attacked with necrosis, possess the power of reproduction : there are several cases on record, in which the scapula was reproduced, after having been destroyed by necrosis; and it is known, that portions of the cranium, under particular circumstances, may also be regenerated. Instances are related where nearly the whole of a parietal bone was reproduced. Considering the little reparation which losses of portions of the skull from the trephine, or external violence, generally undergo, this is what we should not *à priori* expect; yet, in the museum of University College, there is a remarkable preparation, the skull of a person who had been trephined forty years before his death, and where a considerable portion of bone was taken away, which has been in a great measure restored. Generally, the reproduction of bone after trephining does not happen to any great extent; the pericranium being destroyed, and both the tables of the skull being removed, the reparation is very partial. It appears, therefore, that the dura mater does not possess a power of reproducing bone at all equal to that of the pericranium or periosteum of the bones in general; however, if only the outer table be removed, the diploe and the dura mater together will effect the reproduction of the lost portion; but, in other instances, we rarely find that any very successful attempt is made by nature for the restoration of the two destroyed tables. Even fractures of the skull unite with difficulty and slowness. The preparation just now referred to, I regard as a particularly interesting one: in all probability, at the time of the operation, the patient was young, perhaps a child; this I infer from the circumstance of his having been trephined forty years before his death; and, in young growing subjects, the power of reproduction in bones is always considerably greater than in older persons.

Though the long cylindrical and flat bones, may be regenerated, the short cuboid bones cannot be reproduced. When once destroyed, there can be no restoration of them; this fact is one which all men of experience are fully aware of. In the early periods of life, and in healthy subjects, the power of reproduction in bones is always greater than in old or debilitated persons. It is also seriously diminished in particular states of the constitution, and especially when the individual is under the influence of the worst forms of lues venera, or of cancer, scurvy, or rickets. However, some of these constitutional diseases do not absolutely prevent the reproduction of bone in every instance; and exceptions are met with, in which broken bones unite more or less completely in spite of them.

The next subject, respecting necrosis, is a curious and interesting one; I allude to the means adopted by nature to bring about the reproduction of bone. Of this part of the inquiry different pathologists give different accounts, proving that further investigations into certain points would be desirable. The questions are, whether nature accomplishes her purpose by means of the vessels of the periosteum? by means of those of the medullary membrane? or in another manner, in which it is supposed, that, when the whole shaft of a bone has been reproduced, the inner portion of the bone alone has perished, and that the outer one has been saved and transformed into the new shaft? This last opinion is maintained by some men of considerable eminence. They assert, that in necrosis, the whole of the bone does not really perish, that the outer portion is preserved; and that, when the whole shaft seems to have been reproduced, it is in consequence of the external layers separating from the inner ones, which alone are truly destroyed. That the latter representation is not applicable to a great number of instances, I consider perfectly certain; but whether it is *ever* the case, is another question.

Dr. Macdonald, who investigated the subject with considerable talent, found, that the new bone actually began to be formed previously to the complete death of the old one. Both he and Professor Russell observed, that during the formation of the new bone, they could inject the vessels of the old.* These circumstances, so far as they go, would strengthen the doctrine, that the old bone is the source of the new one. The supporters of this doctrine have recourse likewise to another circumstance, as an argument in favor of their view: they take advantage of the fact, that in all, or almost all cases, where new long cylindrical bones are formed, the articular heads are saved, so that these preserved portions must be regarded as contributing also to the formation of the new bone. But this doctrine certainly cannot apply to other instances, in which the whole shaft of the bone is known to have been destroyed through its entire thickness. Cases are continually presenting themselves, in which from the thickness of the sequestrum, there can be no doubt of the whole substance and diameter of the original bone having perished. Then, how would the suggested theory explain the reproduction of portions of the whole thickness of the tibia sawn away, or lost by the effect of external violence? Indeed, the careful observation and correct examination of the different stages of the process of reproduction, tend to prove that, at all events, in some cases the periosteum has a principal share in the formation of the new osseous matter; for it is found to become thickened and more vascular than natural, to assume a pulpy, granular texture internally, a new kind of organisation, fitting it for its increased duty; the cellular tissue external to it also becoming swollen. In the museum of St. Bartholomew's Hospital, are some valuable preparations put up by Dr. Macartney of Dublin, clearly exhibiting these facts. The periosteum then separates from the portion of bone which is about to perish, and becomes covered internally with a vascular pulpy substance, destined for the secretion of the new bone, the nidus for which is, no doubt, at first coagulating lymph. Such are the processes which usually take place when the whole shaft of a bone perishes. They seem to happen also very early; for, in one instance, which Dr. Macartney had an opportunity of examining in an incipient stage, the separation of the periosteum had taken place, though there was only a small abscess formed in the medullary membrane. These facts admit of demonstration, and completely refute the doctrine, which maintains exclusively, that the old bone is invariably the organ by which all the new shaft is produced. I do not mean to say, that there may be cases in which the internal portion perishes and the outer portion lives, any more than that there may not be instances in which the destruction is confined to the outer lamina; we know that these last cases are common enough, in relation to the destruction of a certain extent of almost any bone. Experiments have been made on animals, which tend also to prove the fact of the periosteum being fully capable of, and often actively concerned in, the reproduction of bone: every part of a bone has been removed, all the medullary membrane, and the whole of the osseous texture have been taken away, in order to ascertain whether the periosteum was adequate to restoration of the loſt substance; these experiments demonstrated, that the periosteum possessed such power in a wonderful degree. Some of them were made by Troja, and others by Koehler. Several have been repeated by Mr. Stanley, who sets down this membrane as the most important agent in the reproduction of bone.

---

* In the museum of St. Bartholomew's Hospital, according to Mr. Gulliver, there is the tibia of a dog incased in a shell of new bone, and partly detached; "but the injection has run pretty freely into the old bone."—(Med. Chir. Trans. vol. xxi. p. 6.) Mr. Stanley, however, considers this to be doubtful.

If the surface of a bone has perished to a limited extent, producing a superficial necrosis, the dead bone will exfoliate, or be absorbed, but no reproduction of bone will ensue, the vacancy becoming filled up only with a dense fibrous tissue.

If, from peculiar circumstances, the shaft of a bone die, while the medullary texture is left perfect, and the periosteum is entire, then there may be a complete reproduction effected by the vessels of the periosteum.

In all common instances, however, where necrosis attacks the whole thickness of a bone, the walls and medullary texture both perish. Under these circumstances, the shaft of the bone may be reproduced from three sources. 1. The articular ends of the bone, which are very rarely implicated in necrosis. 2. The periosteum, which invested the dead bone. 3. The soft parts indifferently, whatever their nature may be, which surround the periosteum, supposing this to have been destroyed either simultaneously, or subsequently to the death of the bone.*

Some of Dr. Macartney's views of the subject have been more particularly noticed in his last publication. "The mode (says he) in which the dead bone is removed, and a new one formed, is perfectly consistent with the general laws for the reparation of bone. A vascular substance is created, resembling granulations in structure and offices, for the purposes both of absorption and reproduction, which I have called the *vascular investment.* This new organ *will grow upon whatever tissue lies next the dead bone;* and as the periosteum is usually in that situation, the mistake has arisen of attributing to that membrane the offices of absorption and reproduction; functions, which it would be quite incompetent to perform in its natural state." Dr. Macartney does not agree with those who suppose, that the periosteum, *as such*, is the proper structure for reproducing the new bone.

"The granulation-structure," he observes, "is that which is employed for the separation of different substances that are not fit to

---

* E. Stanley, op. et vol. cit. p. 577.

Google

remain in contact with the living body. Hence, we find it constitute the organ for this purpose in necrosis; in the process of exfoliating bone that is dead; in detaching sloughs; in drawing the line of demarcation in a mortified limb; and in the removal of deciduous teeth.

"When the principal part of the shaft of a bone is necrosed, the periosteum becomes detached from the bones; and from the number of red vessels it now receives, it is rendered soft, pulpy, and perfectly red on the surface next the bone; and, as soon as the work of absorption begins, this surface acquires the form of granulations. As this vascular investment *proceeds inwards*, *devouring the dead one*, the shell of the *new bone is deposited in the back* of the *granulation-structure*, which undergoes the preparatory change into a gelatinous, or cartilaginous tissue, previously to its ossification. The shell is at first of course thin, and with numerous holes in it, for the transmission of red vessels to the vascular structure, and for the exit of a fluid, which hardly deserves the name of pus, in the first instance, if the inflammation be kept down; and as the process advances inwards, the new formed bone becomes thicker and firmer, until at length when the dead bone is all removed, the regenerated one becomes solid throughout. This description applies to those cases in which the whole of the middle of a long bone dies and is reproduced; but, when the skin ulcerates, and a certain portion of the sequestrum or dead bone becomes exposed, that portion is separated by the granulations of the ulcer, by the process of exfoliation, if it be not removed by the operation."*

If in a living animal, a portion of one side of the walls of a bone be removed, without much injury to the medullary texture, the lost bone will be reproduced by the vessels of the medullary membrane. If, in a living animal a portion of the whole thickness of a long bone, *with its periosteum*, be removed, reproduction is not to be expected. But, in man, in consequence of the quietude in which the limb may be maintained, union will take place between the ends of a long bone after such experiment. Here the new osseous matter, which fills the vacant space, is produced at once by the vessels of the medullary membrane, by those of the surrounding cellular tissue, and by those of the walls of the bone. These all produce granulations, which are converted first into fibro-cartilage, and at last into bone.† These facts, and others noticed in the description of the process by which fractures unite, place in a conspicuous view the error of supposing the periosteum to be the sole organ for the reproduction of the osseous tissue.

The sequestrum, when long retained, gradually undergoes a change in its shape and size; but this change is one of considerable slowness; indeed, the total absorption of the sequestrum would sometimes require so long a period, that the patient would hardly live till the completion of the process. The absorption of the sequestrum is probably effected by the absorbents of the vascular substance between the sequestrum and the new bony tube. In the living subject, the dead portion of bone is not so loose within the new case as it is in preparations; in fact, the space between the old and new bone is completely occupied by the pulpy vascular substance. As the new osseous formation is produced before the removal of the old bone, and is external to it, of course it must be larger and more clumsy than the original one. The old bone appears, then, to serve as a kind of model for the new one, and in time, after the sequestrum has been entirely removed, the irregularities on the surface of the new bone are gradually smoothed down, and its thickness diminishes, so that it becomes as nearly as possible of the size and shape of the original bone. The medullary structure is also formed in the new bone. Dr. Macartney had a preparation in which the disease commenced thirteen years before the death of the patient, and, in this case, the interior was becoming cellular, preparatory to the formation of the medullary structure. He had seen a tibia, in which the medullary reticulated texture had been reproduced, although the medullary cells were irregular.

---

* See Macartney on Inflammation, p. 73.
† Stanley, in Med. Gaz. vol. xx. p. 501.

During the whole of the processes by which an original bone is destroyed and regenerated, it rarely happens, that any want of firmness in the limb is experienced; it is not flexible; there is no shortening of it; and, what is equally remarkable, the attachments of all the muscles are preserved as in their original state. In a few examples, however, the new bone is not thrown out fast enough to prevent shortening of the limb. There was an instance at St. Bartholomew's Hospital, a few years ago, of the femur being destroyed by necrosis, and the new bone not being secreted with sufficient quickness and perfection to prevent retraction and deformity of the limb. In that case, amputation was deemed necessary. A poor chimney-sweeper had necrosis of the femur with extensive abscess. This went on very well, however, and a large tumor of new bone was felt around the ends of the dead piece; one near the knee-joint, the other about half way up the thigh. An attack of erysipelas came on, and caused the entire absorption of the new bone, with considerable increase in the extent of the dead portion; so that the next time the prominences, formed by the new bone at the ends of the dead piece, were distinguishable, the upper was nearly as high as the trochanters, and the lower one very near the knee. In another case of necrosis of the femur, the patient, in consequence of the limb being attacked with erysipelas, had one or two ill-conditioned abscesses in the leg, and, what was worse, an abscess of the knee-joint, with ulceration of its cartilages. Such complication, added to the disease in the thigh, rendered amputation indispensable.*

In Weidmann's excellent work on necrosis, are representations of several of the most interesting circumstances which take place in this disease. One engraving shows the protrusion of the dead shaft of a humerus through the skin, in such a way that it admitted of being taken out with the fingers, and exhibits the appearance of the sequestrum after its removal. It is curious to notice, that the lower portion of the dead bone is generally more angular and irregular than the upper. In some of these fine and accurate plates, the drawings for which were all taken from nature, are views of the *cloacæ*, or apertures, forming outlets for the matter collected between the sequestrum and new bone. There are also several plates, representing necrosis of the articular extremities of bones, and amongst them is a very remarkable one, in which there are not less than three sequestra, one in the upper head of the fibula, and two in that of the tibia. One of the plates represents a regeneration of the lower jaw; the case was a necrosis of that bone, and we see the degree of reparation effected by nature, the appearances of the new bony formation, and how well it is calculated to be a substitute for the original bone.

In the treatment of necrosis, it is necessary to consider, that the disease presents itself in three different stages. *The first is attended with inflammation, and is that in which the disease is forming.* In the *second stage, the sequestrum, or dead bone, has been produced, but it is still fixed, and firmly connected to the living parts of the bone.* In the *third, the sequestrum is not only formed, but loose.* Now such varieties in the condition of the disease have a considerable influence on the choice of plans, with the view of promoting the cure.

In the *first stage*, supposing the disease to be extensive, and to be accompanied by severe inflammation of the soft parts, while the sequestrum is only forming, we can do little more than endeavor to check and moderate the inflammation of the soft parts. In this stage, recourse may be had to antiphlogistic treatment, especially leeches, fomentations, and poultices; and sometimes we may cup the part with a better effect, than what is obtained from the other form of local bleeding. It is evident from the very nature of the disease, namely, from the circumstance of its unavoidable and speedy complication with a portion of bone, entirely deprived of all vital action in it, which dead piece of bone, must then be regarded as an extraneous substance, that the utmost we can do in this stage, is to lessen the inflammation and appease the patient's sufferings; the sequestrum will inevitably be produced, and must be got rid of before a cure can be accomplished. In the early stage of the disease, another principal indication is to make free openings for the discharge of abscesses as soon as a fluctuation can be felt.

---

* Cæsar Hawkins, in Lond. Med. Gaz. vol. xii. p. 249.

[We do not agree with Mr. Cooper in his treatment of necrosis in its *first stage.* The pathology of the disease is the same as in mortification of the soft parts, resulting from severe inflammation; and we can generally prevent this mortification, if the disease be treated in an appropriate manner, at a very early period.

Necrosis, is a disease, which usually occurs among the inhabitants of mountainous regions, in summer, oftener than in winter, in males more frequently than in females, in persons of robust constitution, and generally between the ages of five and twenty-five. It almost always attacks the long bones, and the compact structure of these bones. Its favorite seat is the tibia. It seems to threaten the joints, though I have never known it pass from the shaft of the bone, to the joint.

Causes. So far as any thing can be known, it seems to be the result of sudden changes of temperature.

Symptoms. The disease comes on very suddenly. The patient often goes to bed, as well as usual, and in the course of the night, is awakened by severe pain in the part, between, and not in, the joints. There is usually a great deal of constitutional excitement, so much so, that in many parts of the country, the disease goes by the name of "Fever sore."

The part is hot, painful, rather livid, and presents a diffused swelling.

Diagnosis. It may be mistaken for rheumatism, from which, however, it can always be easily distinguished, as the latter is a disease of the joints.

The prognosis depends upon the age, and constitution of the patient, the extent of the disease, and whether it be external only, or external and internal; that is, whether both the external and internal periostea are involved.

Treatment. The indication, is to bring about a resolution. Now this never can be effected, unless the case be seen early, and is at once diagnosticated, and properly treated. The inflammation is violent, and pus is formed by the third day, and, whenever this is formed between the bone and periosteum, there will be exfoliation. The late Prof. Nathan Smith's views, upon this important subject, are the best I have ever seen. With him the treatment consisted in making a free incision through the soft parts and periosteum, to the bone, and if relief was not afforded by the removal of the tension of the periosteum, by the hemorrhage consequent upon the incision, and an emollient application; he inferred, that he had not fully reached the seat of the disease, and proceeded to open into the cancellar structure, by means of a small trephine. This local management, along with the appropriate general treatment, will, if resorted to sufficiently early, commonly produce resolution: if deferred beyond the third day, it will not have that effect, but will arrest the farther extension of the necrosis, and at once alleviate the sufferings of the patient, (vid. Smith's Med. and Surg.: Memoirs edited by his son, Prof. N. R.

Smith.) In the *second* and *third* stages our experience leads us to agree entirely with Dr. Cooper.—Ed.]

In the *second stage* or *that in which the sequestrum is completely formed, yet firmly attached* to the living part of the bone, we are generally obliged to wait till nature has more or less detached it, before any useful steps can be taken for its removal: we know of no medicines that would certainly have the effect of quickening the process of exfoliation; and even when the whole shaft of a bone is in the state of necrosis, it is by the same process that its separation from the living extremities of it is to be effected.

We may usually recognise this second stage of the disease, by observing the presence of fistulæ, through which some part of the sequestrum may be felt with a probe. Many years ago, the proposal was made to apply diluted nitrous acid to exposed sequestra, for the purpose of dissolving the earthy part of them, and thus getting rid of them with expedition. The fear, however, of injuring the sound part of the bone prevented this practice from being extensively tried. This suggestion merits notice, however, because a report was presented to the Royal Academy of Medicine at Paris, in the year 1835, giving highly favorable accounts of a similar practice followed by Delpech, who employed for the dissolution of the earthy part of the sequestrum, the diluted sulphuric acid. This was applied to the exposed dead bone four or five times in the course of the day, and soon afterwards the animal part of the destroyed bone admitted of being taken away with forceps. I have tried this plan in University College Hospital: the acid of course dissolves the sequestrum, but the subjacent bone seems to be acted upon, and more or less destroyed.

The *process of exfoliation*, or that by which the dead portion of bone is loosened and separated from the rest of it, is a particularly slow one, sometimes requiring months and even years for its completion. Though the process is analogous to that by which sloughs are detached, it differs from it in requiring a much greater time; and, unfortunately, we have few means by which we can influence it in this respect. Some surgeons try counter-irritation; they apply blisters and keep them open with savine ointment, for the purpose of expediting the process of exfoliation; this plan was strongly recommended by the late Mr. Crowther, in a good practical work, which he wrote on the subject of necrosis and diseases of joints, and, at one time, such treatment was extensively adopted in some of the London Hospitals. I believe, that counter-irritation, with blisters, or issues, setons, and the exhibition of tonics, or of the iodur̀etted solution of the hydriodate of potash, according to circumstances, may tend in some degree to quicken the process of exfoliation. At all events, a blister, seton, or issue, is often beneficial in lessening the disposition to repeated attacks of inflammation in the deeper parts of the limb, the recurrence of painful and profuse abscesses, and all the severe constitutional disturbance which is so liable to arise from these states of the disease. In necrosis, the health suffers, not merely from the discharge which is so copious and long kept up, but from the repeated recurrence of fresh inflammation, and renewed formations of matter after other abscesses have been nearly, or quite cured. Sometimes we may essentially serve the patient by supporting his strength; for, when he is languid and debilitated, or much reduced by hectic complaints, the process of exfoliation will not go on so well, as it would do if the actions and functions of the system at large were carried on with more vigor and less disturbance. We know that exfoliation naturally proceeds more quickly in young persons than old ones, which may be regarded as fortunate, because a larger proportion of the worst forms of necrosis happen in young subjects. As Mr. Stanley has observed, in some cases, and these in whatever circumstances the death of the bone has taken place, whether from constitutional or local causes, from external violence, or otherwise, the sequestrum will still retain its connexion with the living bone, and no exfoliation ensue. This gentleman had seen cases, where, many years after the death of a portion of bone, it was found to have undergone no change whatever; nor had any separation of it from the living bone taken place. " In many cases, the causes of this failure of separation seem obscure: in some it may arise from simple debility, or a peculiar derangement of the system; or it may be the effect of a diseased condition of the soft parts surrounding the dead bone. This is perhaps capable of illustration by those cases, in which necrosis takes place from the influence of the venereal disease. In these, a portion of the front of the tibia, for example, having perished, and the skin covering it ulcerated, dead bone is exposed, and becomes perfectly black; but it undergoes no further change. At length, after it has remained in this condition for some months, a suspicion begins to be entertained of its syphilitic nature, and mercury is administered: when, as soon as this remedy commences to affect the system, the sore assumes a healthy character, and the process of the separation of the dead bone commences. It may be, however, that the mercury excites the absorbents to action, independently of its influence on the constitutional affection."* Instead of mercury, which often has very pernicious effects on the general health, where necrosis exists in a syphilitic patient, I usually prefer giving the iodide of potassium.

Notwithstanding all that can be done, by means of tonics, iodine, blisters, &c., assisted with an eligible diet, notwithstanding the most judicious support and regulation of the general health, a complete cure of necrosis, in its second stage, by natural process, that is, by the absorption, or annihilation of the sequestrum, and the subsequent healing up of the fistulous openings, is not frequently accomplished. I have attended several young subjects, however, in whom a necrosis of the upper portion of the humerus terminated in this favorable manner. In the generality of instances, active and sometimes remarkably bold measures become necessary; but these can seldom be adopted with any success during the second stage of the disease. Sometimes, however, in this stage, we are absolutely compelled to amputate the limb; for if the health should be so dangerously reduced and deranged by the pain and irritation, and profuse discharge, that a further perseverance in attempts to save the limb would be more likely to lead to the patient's death than the cure of the necrosis, we should then be called upon to amputate the limb. This necessity occurred in a case, from which one of Weidmann's engravings was taken; there was a necrosis of the condyles of the femur and of the head of the tibia; and the health being so seriously reduced as to render further attempts to save the limb improper, amputation was performed by Siebold. In Mr. Liston's collection is a fine specimen, in which the bones of the knee are not only involved in the ravages of necrosis, but also dislocated. Whenever necrosis involves a large joint, the patient cannot be expected to recover without amputation. Sometimes, patients with necrosis are attacked with erysipelas; and abscess of the knee-joint, with ulceration of the cartilages, is added, perhaps, to necrosis of the shaft of the femur, or tibia : this is a case for amputation, as illustrated in that recorded by Mr. C. Hawkins. When the case is necrosis of the femur, and the new bone gives way, followed by irremediable deformity of the limb, and profuse abscesses, amputation may be called for. The possibility of such an unfavorable change dictates the propriety of affording, in some instances, the support of a splint, or other mechanical apparatus, for a certain time after the removal of a considerable sequestrum.

---

* Op. et vol. cit. p. 579.

In a necrosis of the femur, the sharp point of a sequestrum has been known to open the popliteal artery, and give rise to an aneurism; and the patient, who refused to submit to amputation, died of mortification and hemorrhage.*

In the *third stage of necrosis*, or *that in which the sequestrum is loose*, the dead bone can only be regarded as an extraneous body, keeping up more or less irritation and suppuration. This removal, therefore, either by natural processes, or by the interference of the surgeon, is now necessary for the cure. Sometimes one end of the sequestrum will actually make its way through the skin, and will protrude, and then it may be easily taken away; but, in other instances, where it is completely surrounded by a new bony tube, an operation will mostly be required, sooner or later, for the purpose of extracting it. In young subjects, the dead portion of bone, even though thus circumstanced, is sometimes removed by natural processes. In general, however, we are obliged to cut away a portion of the new osseous deposit that confines it. *When we find the health good, the discharge lessening, and the fistulous openings inclined to heal*, there is no urgency for an operation. *But when the health is suffering, the discharge copious, and the sequestrum known to be loose, that is, can be felt to be so, it becomes an object to remove the dead bone from within the osseous tube*, which is frequently so hard as to require the cutting pliers, saw, or trephine. Suppose the sequestrum to be surrounded by a bony tube, we should make an incision over that part of the new osseous formation, under which we have ascertained with a probe, that the loose dead bone is situated. Having done this, we may generally see the cloacæ, through which we make another examination of the sequestrum with a probe. Then, by cutting the interspaces, or bridges, between two of these apertures, or enlarging one of them with the cutting pliers, we make sufficient room for the extraction of the sequestrum. At all events, as much of the bony case as will enable us to get at and remove the dead bone within it, must be cut or sawn away. After the dead bone has been exposed to a sufficient extent, it should be cut in half with a pair of cutting pliers, or one of Hey's saws: an elevator is then to be used to force the end of one of the fragments outwards, which being drawn out gently facilitates the extraction of the other half. We should avoid making several openings in different parts of the new bony case, because it would destroy too much of the new bone, and injure the soft parts to too great an extent. When the new bone is very thick and hard, the application of a small trephine may become necessary.

---

* W. H. Porter, in Dublin Journal of Med. Science, vol. v. p. 190.

In many instances, the sequestrum does not extend through the whole length of the tube, only certain portions of the original bone being destroyed, and consequently, the new bony formations are then only at particular points.

In unfavorable and extensive cases of necrosis, amputation sometimes becomes indispensable, because the patient's constitution cannot bear the repetition of the operative proceedings necessary to get away every part of the dead bone; for it frequently happens that we cannot remove all the sequestrum at once, and then several operations become necessary. In the course of the treatment, tonic medicines, bark, sulphate of quinine, chalybeates, the carbonate of soda and rheubarb, or the salts of iodine, will usually be needed. Sometimes, however, we are compelled to return to antiphlogistic means. In the course of a year, there may be from eight to sixteen attacks of severe inflammation of the soft parts followed by new abscesses on each occasion, and under these circumstances, reluctant as we may be to do any thing to weaken the patient further, we are obliged to employ local bleeding and other antiphlogistic remedies with moderation. Then, if we consider the unavoidable irritation and drain upon the system, produced by the long continuance of the disease, we shall not be surprised that, in many instances, the patient should be reduced so low by hectic fever, that amputation is the only chance of preservation remaining for him. We must not, however, take off the limb unnecessarily, but remember that nature will do a great deal for the patient in this disease; and, as I have explained, it is in the osseous texture that she possesses, perhaps, a greater power of repair and reproduction than in any other tissue of the body.

Mollities ossium is a very rare affection, and one that is sometimes erroneously confounded with rickets. In mollities, the bones become preternaturally soft and flexible; those of the lower extremities may indeed, in some instances, be bent in such a degree that the outer ankle can be brought against the temple without the femur being fractured. In the natural state, the bones contain more than half their weight of earthy matter, and I believe that, in some instances, the proportion of it amounts to nearly two-thirds of their whole weight. But, in the morbidly softened state of the bones to which I am referring, the earthy matter is only in the proportion of one-fifth part to four of the animal matter in their composition, and sometimes even less. There are several striking differences between mollities ossium and rickets. The former is a particularly rare disease, whereas rickets is one that is seen daily. Mollities ossium hardly ever takes place except in females, and in those who are above the middle period of life; whereas rickets chiefly attacks children, or, at all events, those who are under puberty. Another distinction is, that in rickets, the earthy matter is originally deficient; the bones have never been properly developed from birth; but, in mollities ossium, the bones attain their full growth; their texture is perfect; and their proportion of earthy matter is quite right, until about the middle period of life, when those peculiar changes in the texture of the osseus system take place, which constitute the disease under consideration. Mollities ossium, appears to arise from some defect in the nutrition of the bones; but the exact cause of it is not understood. Some writers confound *mollities* with *fragilitas ossium;* but the two diseases seem to be the reverse of one another. Thus, when the thigh-bone is so soft, that the outer ankle can be placed against the temple, this must be a different case from fragility, in which the bone cannot be bent at all without breaking. Sometimes in mollities ossium, nearly the whole of the natural texture of the bone is absorbed. A bone in this state is found to contain cells, filled with a brown or livid substance, and having communications with the cells on the outside of the bone, or, in other words, with the cellular tissue. When the osseous system is thus affected, of course it is disqualified for its functions, as it can no longer support the limbs; nor will the bones, thus altered, serve as levers for the mucles to act upon; neither can they afford that protection to cerimportant parts which they are designed by nature to give. Hence, in the worst forms of mollities ossium, the stature is so much altered, that persons afflicted with this disease, who were originally five or six feet in height, become not more than two:—thus Madame Supiot, whose case is the most remarkable one on record, was, at the period of her death, only twenty-three inches in height. In her case, there was also such a change in the shape of the bones, that the compression of the thoracic viscera was probably the circumstance which mainly contributed to put an end to her miserable existence. Her limbs could be bent in the extraordinary manner I have explained, without breaking. Mollities ossium, so far as all our present information reaches, is invariably a fatal disease; for there is no instance of it on record in which a cure was effected. It is accompanied by immense disturbance of the constitution; in particular, constant and profuse perspiration; a very copious deposit of phosphate of lime in the urine; and a great deal of fever. Here is another great difference from rickets; in which there is not necessarily any severe degree of constitutional disturbance; the disorder of the bones not being the cause of any fever or pain. But, in mollities ossium, the patient's sufferings are truly deplorable, and the health is universally and totally deranged. In rickets, there are no profuse sweats—no copious deposit of phosphate of lime in the urine. It is not my meaning, that rickets may not be combined with very bad health; but, when this is the case, the complication is only an accidental and not an essential one. There may be marasmus and great constitutional disorder with rickets, or not. In the treatment of mollities ossium, the phosphate of lime has been given, on the supposition that there is a deficiency of that earth in the system. Though an unusual quantity of phosphate of lime seems to be thrown out of the system by the kidneys, it does not follow as a matter of course, that there must be any want of it in the constitution. The fault lies, probably, in some inexplicable derangement in the nutrition of the osseous system, either interfering with the regular deposit of that substance, or causing its too rapid absorption and conveyance out of the system. Acids and tonics have been tried; but every thing has proved inefficient.

Fragilitas ossium, consists in an unnaturally brittle state of the bones. In the advanced stages of syphilis, cancer, fungus hæmatodes, scrofula, and scurvy, so great a weakness and fragility of the texture of the skeleton are sometimes occasioned, that fractures take place from trivial causes, and are therefore termed *spontaneous*. In the museum of University College, is a thigh-bone, which broke as the patient was merely turning himself in bed, and the accident happened while he was taking mercury for nodes on the opposite thigh-bone, which is also in the same museum. In the same collection, is another specimen, in which the humerus was broken by champooning; the patient had scrofula, and while the limb was undergoing the champooning process, the bone broke; this first fracture united; but a second fracture happening afterwards in another place, a false joint formed in the situation of the injury. The bone was so brittle, that when the surgeon was dissecting it after death, it broke in a third place.

In old age, there is always a degree of fragilitas ossium, and this is generally explained by the circumstance, that, in the bones of old persons, there is a large proportion of calcareous matter to the animal and vascular matter in them. However, they contain likewise a great quantity of greasy matter; and on this account can never be well cleaned so as to make white good-looking skeletons. The other varieties of fragilitas ossium are attended with a diminution in the quantity of phosphate of lime; and when there is really an increase in its quantity, it is, I believe, only in that form of fragilitas ossium which comes on as the natural effect of old age. In all the other forms of this disease, the bones are generally lighter than natural. The fragilitas ossium of old age is of course incurable. In other examples of it, arising from different disease of the constitution, the cure will entirely depend on the possibility of curing the original disease; if this can be cured, there will be a chance of the proper texture of the skeleton being restored; but, under other circumstances, no hope of a cure can be entertained.

I was called some time ago to a patient, whose thigh-bone broke as he was turning in bed; it appeared that he had a cancerous disease of the bladder, for, after death a large fungous tumor was found in that organ, situated upon so hard a cartilaginous base, that when felt through the bladder, it was at first supposed to be a stone. One of the ribs was also broken, and both this fracture and that of the femur were surrounded by a mass of scirrhous matter.

In some individuals, not beyond the middle period of life, or even considerably below it, the bones are extraordinarily brittle, without any assignable cause. As a stout man, a patient in the Middlesex Hospital, was cutting a slice of bread, the humerus broke. I have heard of young and apparently healthy persons, whose bones were so brittle, that they were continually breaking from very trivial causes. It is remarkable, that in almost all such cases, the fractures unite just as well as in others.*

Rickets or *Rachitis*, principally affects children, and mostly between the ages of eight months and three years. Besides the differences from mollities ossium already specified, there is not in this last disorder the same thickness of the cranium, which is commonly observed in rickets; sometimes, indeed, the thickness is immense. As Mr. Shaw has observed, the derangement of the minute textures is exhibited in the skull in a remarkable manner, some parts of the calvarium having an extraordinary thickness, while other parts of it are reduced to the thinness of paper, and the divisions of the tables are lost. Sometimes the parietal bones become seven-eighths of an inch in thickness; while, in the situation of the fontanelle and sutures, the cranium is surprisingly thin. Hunauld presented to the Academy of Sciences a skull-cap, taken from a child, between three and four years old, where the bones were in some places seven or eight lines in thickness, and when squeezed, blood and serum issued from their interstices. Bones, affected with true mollities, never recover their natural texture, and, sooner or later, the disease proves fatal; but, in rickets the bones often acquire a better shape, and a greater degree of firmness, as the child grows; indeed, they often acquire such a degree of firmness as fits them perfectly for the performance of their functions; and some rickety children grow up to be remarkably athletic subjects. When the disease, however, is in an aggravated form, the deficiency of phosphate of lime is sometimes so great, that nothing but the shell of the bone is left, the internal part being filled with cells containing a red sanious fluid. Although there is in this circumstance a degree of resemblance between rickets and mollities ossium, it is to be recollected, that the bones in the former disease cannot be bent as they can in the latter. With respect to the change in the bones, it does not merely consist in a deficiency of the secretion of phosphate of lime; in addition to the loss of firmness from that cause, there is a disorganization of the minute textures of the bones—and this is so much the case, that, in aggravated cases, the walls of the long cylindrical bones may be entirely removed, and the whole interior preserves, according to Bichat, a homogeneous appearance, and consists of cellular texture throughout. Perhaps, however, some examples of this description, referred to by writers, might have been true cases of mollities.

---

* See Mayo's Pathology, p. 18.

In rickets, nature makes great efforts to obviate the effects liable to occur from the weakness of the bones. In a bone, bent by the disease, in proportion as the walls of the larger curvature are thinned, the walls of the lesser one are thickened and strengthened. The reason of this is, that the lesser curvature has all the weight of the body to support, and, if there were not this provision made, the bone would be incapable of supporting any weight. For some valuable observations on this subject, we are indebted to Mr. Stanley.

One effect of rickets is to flatten the long cylindrical bones, and the greater diameter of the bone, when thus flattened, is always from the forepart of the curvature backwards; thus the same result is produced as what arises from the wall of the lesser curvature being thickened—the bone is strengthened by it. When the cylindrical bones are affected with rickets in an extreme degree, even the medullary canal is sometimes obliterated, in consequence of one side of the wall of the bone acquiring an immense thickness.

Sometimes in rickets the bones bend laterally, and the convexity of the curve may be on either side of the limb.

It has been supposed, that the heads of rickety bones expand; but this is not usually the case; the joints seem large in this disease; yet this is proved by dissection to depend principally upon the emaciation of the soft parts. Bichat has adverted to a thickening of the periosteum in rickets; but this is not commonly observed.

As it is principally the weight, which the bones have to support, that makes them bend, it follows that those of the lower limbs must be more liable to deformity than the bones of the upper extremities. There is, however, in the museum of University College, a humerus, that has been twisted by the action of the muscles, in consequence of which the ulna has been moved partly into the place of the radius, and the radius displaced. The upper head of the latter bone, no longer having the humerus to play upon, is elongated, and altered in its shape. In the same collection is likewise a skeleton, in which is seen an extraordinary deformity of each humerus produced by the pressure of crutches. The skeleton is that of a boy, about ten or twelve years old, and it shows various other interesting circumstances connected with rickets; for example, it exemplifies the slow development of teeth, and the imperfect formation of the alveolar processes, occasionally noticed in rickety children. The preparation is interesting on another account; for, here rickets was complicated with a scrofulous caries of the vertebræ. Many writers incline to the belief, that rickets is essentially connected with scrofula; but this is an erroneous opinion. It is true that scrofula may be accidentally joined with rickets, as in this instance, but we frequently meet with rickets where there is no scrofula in the system. The skull of this subject is also surprisingly thick, more than an inch, I believe, in some places; and many of the bones and their processes are but very incompletely developed. This is certainly the case with the vertebræ.

It was an observation, made by the late Mr. Shaw, that in whatever state of distortion the spine and ribs may be, the bones of the pelvis will not be found distorted, unless there be at the same time marks of rickets in some of the long and solid bones; and it is argued by his brother, that as neither of the bones of the upper, nor those of the lower extremities become incurvated, *when the distortion commences near the age of puberty*, it follows, that a cause, totally different from rickets, gives rise to it, and that the pelvis incurs no danger of being implicated in this deformity. Mr. Alexander Shaw, therefore, considers those skeletons only as true specimens of rickets, in which the distortion is exhibited throughout all the osseous system together—in the skull, the cylindrical bones of the extremities, and the large bones of the pelvis, as well as in the spinal column and the thorax. The figure of a rickety skeleton is distinguished by the head, the thorax, and the arms being preponderating and large, while the pelvis and lower extremities are, in a relative degree, diminutive and short. In the skeletons examined by Mr. A. Shaw, all the bones were to a certain degree deficient in size; but such want of development was much more considerable in the lower half of the skeleton, for the vertebral column and arms wanted scarcely one fifteenth of their natural length, while, in the bones of the lower extremity, one third of it was deficient. In the pelvis, the bones were nearly a quarter under their natural size. Hence, when the pelvis is deformed by rickets, it is not only those diameters, which are contracted by the thrusting inwards of the bones that are smaller than usual, but all the diameters are less than natural; whereas in the deformity of the pelvis from mollities ossium, in proportion as one diameter is lessened, the other is elongated.

I have stated that the common period of the commencement of rickets is between the ages of eight months and three years; but the disease may begin in the fœtus, of which fact we have an example in the museum of University College.

There is a deformity of the spine arising in young persons who are growing with great rapidity, especially in females, which does not depend on any disorder of the bones analogous to rickets, but on the circumstance of such individuals not exercising their muscles equally, or on their being prevented from taking the free and unconstrained positions and exercises most agreeable to nature. Under such disadvantages, the spine becomes deformed, without any imperfection in the texture or development of the bones, and consequently there is no rickety disease of them. When the curvature of the spine, arising from such causes, is not too considerable, and the growth of the individual not yet completed, the deformity may be removed by letting all the muscles of the trunk be daily exercised in a free, regular, and uniform manner, so as not to suffer one set to be put more into action than another. It is on these principles that gymnastic feats and manœuvres become exceedingly useful in the treatment of those deformities of the spine, which are so common in girls during their growth. However, if the deformity has been of long standing, it will be impossible to remove it in this or any other way; for the disease then approaches in its nature to that kind of deformity of the skeleton, which results from old age. When a rickety curvature is in the dorsal vertebræ, the upper part of the spine is usually inclined to the right side, and the consequence of this is, that there is such an alteration in the position of the ribs, that a great convexity of them is produced on the right side, and a flattening of them on the left. Then the scapula is made to project backwards, and the right shoulder is thrown forward. In consequence of the flattening of the left side of the thorax, there is hardly room enough in it for the proper action of the heart, and the due expansion of the lungs. In many instances the

33*

spinal column is not merely curved, but twisted spirally. In the museum of University College is a preparation affording a fine illustration of such deformity: there is not only a curvature of the spine, but a complete twist of it, insomuch, that, in one part, the spinous process of the vertebræ are brought nearly round to where their bodies ought to be situated.

In some of these cases, the clavicle may be displaced, in consequence of the alteration in the position of the shoulder, that is, the sternal end of that bone may be thrown inwards so as to press upon the œsophagus. An instance of such displacement of the sternal end of the clavicle is mentioned in Sir Astley Cooper's work on dislocations, and the pressure on the œsophagus was such, that the surgeon, under whose care the patient was placed, was obliged to remove a portion of the clavicle in order to prevent the fatal consequences which would have arisen from the impediment to deglutition. Amongst the preparations in University museum are some showing the alterations in the form of the female pelvis occasioned by rickets. Frequently the sacrum is displaced; and the ossa innominata are thrown inwards, so as to give the pelvis a triangular shape. In rickety females, the bones of the pelvis are not properly developed, and the pelvis is surprisingly small.

When there is a bend of the spine in one direction, there will frequently be another in exactly the opposite direction to counterbalance it, and sometimes there will be even a third curvature, so that the spine will represent an italic *S*, as is illustrated in an excellent specimen in the above-mentioned collection.

Treatment. With respect to the cause of rickets, the subject is very obscure. Perhaps the observation of Mr. Stanley is correct, that it is not an affection peculiar to, that is, restricted to the osseous system. The muscles, surrounding the soft rickety bone, are pale and flabby, and probably contain less than their natural quantity of fibrine. It is likely, also, that the deficiency of phosphate of lime, one of the characteristics of a rickety bone, is the result, not of peculiar local action, but of a general constitutional deficiency of assimilation and nutrition, by which the peculiar character of the muscular tissue is coincidently produced.* As the disease consists either in a congenital defect in the organisation of the bones, or in such defect arising in infancy, it is to be expected that nature must be more confided in than any medicines, or other means, for the removal of the imperfection, which the deformity and bending the bones are only an effect of. We know of nothing that has the direct power of so altering the texture of the osseous system, as to communicate to it a due consistence, to rectify the derangement of its nutrition, and promote its full development. While the bones are under the influence of these imperfections in their texture and nutrition, they gradually yield under the pressure of the parts above them, and to the action of the muscles connected with them; and hence they bend, and deformity ensues. Now, the question is, how can we counteract these two causes of deformity? One would say, of course, by keeping the muscles from acting, and taking off the weight of the parts most liable to affect the bones by their pressure on them. But considerable difficulty is experienced in putting these principles into execution; for, if the individual be confined long in the recumbent position without being allowed to use his muscles, his constitution soon begins to suffer—he looses his strength—and his health gets into a state in which no improvement in the texture and development of the bones can take place. Again, if we attempt to take off the weight of particular parts by the use of machinery, the pressure will only be transferred to other parts; thus, in the application of machinery to take off the weight of the head, chest, and upper limbs, from the spine, we should be obliged to use the pelvis as a fulcrum, and thus deformity of the bones of the pelvis might be produced. I have mentioned a skeleton, in which the humeri have been vastly deformed by the pressure of the crutches on which the individual supported himself. However, it is not my intention to say, that the use of machinery in rickets should be entirely relinquished; perhaps, in some cases, it is preferable to a rigorous observance of the recumbent position, in which the patient always loses his health. Whatever tends to strengthen the constitution, has a decided tendency to promote the removal of the rickety disorganisation of bones; and, as the individual grows and acquires strength, those parts of the osseous system which the disease has deformed, will assume greater strength, and a better shape. In the treatment, therefore, it is always an important object to rectify any manifest disorder in the health, and in particular to keep up the child's strength. Many rickety patients are more or less debilitated, emaciated, or big-bellied, and some of them plainly scrofulous. To these sea-bathing will prove eminently serviceable, care being taken to promote the cutaneous circulation by the use of the flesh brush, or friction with napkins. Tonics, and particularly steel medicines, will also be beneficial. When the curvature of the lower extremities is considerable, machinery may be applied, and when the deformity is conjoined with an inversion of the feet, a great deal may be accomplished by means of mechanical contrivances sold in the shops. But I think that, where machinery is employed, the patient should be allowed to exercise his muscles for a certain period of the day. I have already remarked, that many deformities arising from rickets may be cured entirely on gymnastic principles; that is, the patient is obliged to follow up a certain train of exercises, which put all his muscles into regular and equal action; and one principle is to put into action the antagonists of those muscles, whose preponderating activity and strength have led to the deformity, as well as those muscles themselves. Thus, when the spine is drawn to one side, by the right arm and shoulder being used more than the left, the object is to put the muscles of the left side into regular exercise, in order to counteract the effect of the muscles of the opposite side. The imperfection in the organisation of bones, depending upon rickets, may be removed, and yet such bones never recover their proper shape. They acquire strength, but continue deformed. It is well known, in fact, that in some persons, whose bones are restored to their right texture, though yet bent and disfigured, the muscles acquire remarkable power, and some individuals, so circumstanced, have been distinguished for feats of strength and agility.

---

* E. Stanley, in Med. Gaz. vol. xx. p. 641.

An *exostosis* signifies a tumor of a bony nature growing upon and arising from a bone, or an enlargement or hypertrophy of it. Sir Astley Cooper describes exostosis as having two seats; by *periosteal exostosis*, he means that form of the disease, in which bony matter is deposited between the periosteum and the surface of the bone; but, by *medullary exostosis*, he implies a growth from the medullary texture, by which the bone is expanded and ultimately absorbed and destroyed, so that the tumor protrudes externally. Now, this latter kind of tumor does not consist entirely of bone, and some forms of it are of a malignant character, partaking of the nature of fungus hæmatodes, or medullary cancer. Sir Astley Cooper has also divided exostoses into *cartilaginous* and *fungus*, the former being preceded by a cartilaginous deposit, into which osseous matter is afterwards secreted, while the latter seems to be really fungus hæmatodes, or medullary cancer of the bones.

An exostosis may arise from the periosteum, or from the surface of a bone, or from its cancellous texture. When originating from the first of these situations, it may, in the early stage, be readily separable from the bone, but afterwards become united to it by osseous, cartilaginous, or dense fibrous tissue. At first, it receives an immediate covering from the periosteum, but this soon becomes absorbed, and then a dense cellular tissue forms its investment. And, lastly, when it arises from the cancellous texture, it will gradually extend, and make its way through the walls of the bone and the periosteum.*

The largest *true exostoses* are chiefly met with on the long bones, and if considerable ones are sometimes met with on other bones, they are generally not of the true kind; thus, in the *cartilaginous exostosis of the medullay membrane*, described by Sir Astley Cooper, the shell of the bone is extremely thin, and, within it, there is an elastic, firm, and fibrous substance. In other instances, a medullary substance presents itself, which is known to have the character of fungus hæmatodes; whereas, the fibrous growth is not of a malignant nature. It is universally admitted, that the blending of so many diseases together, under the name of *exostosis*, creates a vast impediment to a clear view of the subject; and it would be much better, if the term *exostosis* were limited to a bony tumor, growing out of a bone and forming a projection on its surface, or an enlargement of a part of the bone itself, and not consisting in the growth of a soft substance in the interior of the bone, followed by an expansion of its walls, and afterwards of a protrusion of the fungous or fibrous mass itself.

---

* E. Stanley, in Med. Gaz. vol. xx. p. 648.

With respect to the physical characters of a true exostosis, it may have the whiteness and density of ivory; or it may be dark colored, and of a cancellous texture throughout; or it may be made up of a mixture of two such tissues; and again, there may be some cartilaginous matter in it which may be deposited interstitially with the bone, or may be limited by a well defined line to one part of the tumor, and this is usually the base, which may be movable on the bone from which it has arisen. This diversity of texture has no relation to the size or duration of the tumor.*

Various terms are applied to true exostoses, according to the textures which they exhibit; some are *lamellated*, there being distinct layers observable in their texture; others are *cellular;* while others are so solid and hard, that they resemble ivory, and hence are called *ivory exostoses*. Some are so irregular and angular, that they receive the name of *stalactitic* or *spinous exostoses*. A most extraordinary specimen of this form of exostosis is described in the Philosophical Transactions; for the whole skeleton was affected; and the bony formations had all the fantastic shapes of coral. One extended from the os coccygis to the femur; and hardly a joint was left, whose motions were not stopped by the bones being connected together with those spinous productions.

A true exostosis is always completely fixed and immoveable, and, at first, unattended with any pain or inconvenience; it generally comes on in a very slow and indolent manner, and sometimes remains, for several years, nearly in a stationary condition. Indeed, it is generally some years before it produces much inconvenience, and then it may cause severe agony, and occasion dangerous functional disturbance by its pressure on particular parts. An exostosis of magnitude, situated behind the knee-joint, has been known to interfere with the action of the flexor muscles. The growth of an exostosis from the os pubis has by its pressure rendered the urethra impervious. An exostosis of the thigh-bone, though of small size, has been known, on account of its projecting angular shape, to obliterate the femoral artery; an instance of which occurred in the practice of Dupuytren. An exostosis of the orbit has frequently produced a displacement of the eye. An exostosis of one of the lower cervical vertebræ has been known to press upon and obliterate the subclavian artery. An exostosis, extending backwards from the lower jaw, has produced a fatal impediment to respiration, by its pressure on the larynx. Fixed pain in the head and epilepsy have been produced by the growth of exostoses from the inner table of the cranium. We have, then, numerous examples of the dangerous consequences of exostoses in particular situations; indeed, the prognosis in this disease materially depends on the situation of the tumor, and the possibility of removing it, with due regard to the parts amongst which it is placed. I am here speaking of true exostoses; because others, of a medullary character, are entirely different diseases, the cure of which involves the question, how far it is possible to cure, or effectually remove, fungus hæmatodes by operation.

---

* E. Stanley, in Med. Gaz. vol. xx. p. 642.

Exostoses are frequent on the femur, tibia, humerus, and lower jaw; and not uncommon on the sternum, clavicle, and bones of the head and face. There are no bones on which they may not be produced. The upper part of the humerus and tibia, and the lower part of the femur, especially near the insertion of the adductor magnus, are their ordinary situations upon these bones. I was lately consulted for a girl, about thirteen years of age, who has an exostosis connected with the outer condyle of the femur, and interfering with the free action of the biceps. Sometimes an exostosis forms at the insertion of the psoas and iliacus.

The causes of exostoses are involved in considerable obscurity. True exostoses occur most frequently in young persons, but less usually before, than after the age of ten or twelve years. It would appear as if there existed in some individuals a predisposition to the disease, exostoses forming, in such persons, from very slight and trivial exciting causes. A little while before I began my professional studies, at St. Bartholomew's Hospital, a youth had been sent into it from Cornwall, the particulars of whose case were always mentioned by Mr. Abernethy in his lectures. In this individual, a trifling blow on any part of his body would invariably lead to the production of an exostosis; and this disposition to form bony tumors was not confined entirely to the skeleton; for, after a blow on the muscles, a sort of osseous deposit would take place in them; in fact, the margins of the axillæ had become ossified; the great pectoral muscle and the latissimus dorsi were both turned into bone at their edges, so that the patient was completely pinioned. In a preparation in King's College Museum, the femur is immoveably fixed in the acetabulum by ossification of the front of the capsular ligament, and of part of the iliacus internus. Mr. Langstaff has a beautiful specimen of ossification, which appears to have spread from the femur, and involves the vastus internus, the structure of which is converted into bone.* The alliance between ossification of ligament, muscle, tendon, and exostosis, or the origin of the former, from the bones, is well exemplified in Jeff's skeleton in the museum of the Royal College of Surgeons in London. Local irritation of the periosteum, by an external injury, would appear sometimes to act as a cause. In certain examples, where exostoses form numerously and almost without any assignable reason, the state of the constitution is to be suspected; and, as Mr. Stanley has noticed, the disposition to exostoses appears occasionally to be hereditary, as in the instance of a man in St. Bartholomew's Hospital, who had many exostoses, and whose father and children had been similarly afflicted. When pressure is made upon a bone for a considerable time by any kind of mechanical aparatus, a bony swelling is sometimes thrown out. In young persons, whose growth is rapid, nothing is more common than an irregular development, or an hypertrophy of the clavicle, ribs, or sternum.

Treatment.—Excluding from present consideration *venereal nodes*, perhaps we possess no means of checking the growth, or preventing the increase, of a true exostosis. I have been sometimes consulted by patients for exostoses, and have tried, as a matter of form, blistering, mercury, and iodine preparations, but have rarely or never seen a case that was materially benefited by them. Sometimes, however, an exostosis leads to inflammation of the soft parts, and then of course we should employ common antiphlogistic plans, viz. local bleeding, cold evaporating lotions, aperient medicines, and perhaps the blue pill, or calomel with opium. The inflammation may be relieved in this manner; but, as for dispersing the tumor by medicine, there is not the slightest chance of it. Yet, in many instances, surgery may be of essential service; for, though we cannot disperse an exostosis by external or internal medicines, we may, when it is producing dangerous effects by its pressure on neighboring organs, remove it, or cut it away with Hey's saws, trephines, cutting forceps, or saws capable of working by machinery in deep confined spaces. Of course I mean, that an operation is to be performed only when it can be done without danger to the neighboring organs. In the operation, the first object is to make such a division of the soft parts as will enable us to get at the base of the tumor without difficulty. There will be much difference in the facility of removing the tumor in different instances: its shape is one circumstance that will have influence; when its base is broad the operation will generally be difficult; but sometimes the base of an exostosis is narrower than its body, and then its removal may be easily accomplished with a saw or pliers. Even when we are not able to remove the whole of a true exostosis, we may sometimes do essential good by taking away a part of it; for this kind of bony tumor is not attended with any malignity, and meddling with it will not turn it into any dangerous variety of disease. In some instances, when it was not practicable to saw away the tumor, attempts were made to get rid of it by purposely exciting necrosis of it, by removing the periosteum from its surface. A few years ago, I was consulted by a woman who had an immense bony swelling on the face. As several medical practitioners suspected that it arose from a fungus in the antrum, a point on which I had doubts, I sent her to Mr. Lawrence for his opinion, who coincided with me that it was an exostosis of the upper jaw-bone. Now, in this example, after vast suffering, and repeated inflammation, and abscesses of the soft parts, the bony tumor came away spontaneously: it was attacked with necrosis, and exfoliated. The tumor, which was very large, came away by considerable pieces at a time, and the woman is cured, I believe, with the exception of a good deal of disfigurement of the face. After having been removed by operation, exostoses do not generally form again. Exceptions, however, are occasionally met with. A young woman had an exostosis of the humerus, which was sawn off. In a year another exostosis grew nearly in the same place; but, on a rubefacient plaster being applied, an abscess formed, and the new bone was absorbed.* This proves that suppuration excited contiguously to an exostosis may lead to its absorption; but success of this kind is not common.

---

* See Mayo's Pathology, p. 15.

An exostosis may be so situated that we cannot prudently attempt any operation upon it; for instance, it may be so near a large joint, that any attempt to remove it would not only endanger the limb, but the patient's life. The exostoses, or abnormal enlargements of the clavicle, sternum, &c. so common during the rapid growth of the body, require no treatment. As Mr Mayo observes, they are almost sure to disappear after a year or two; either the rest of the bone grows up to the enlarged surface, or the superfluous part is absorbed.

Medullary tumors, sometimes injudiciously classed as exostoses, are of the same nature as fungus hæmatodes. The disease is of frequent occurrence, usually begins in the cancellous texture, and, in the majority of instances, is not accompanied by a similar morbid deposit in other organs. Mr. Stanley has never seen a case, in which the disease seemed to have originated in the compact texture, or the periosteum. It generally, though not always, occurs before the age of forty; and its most frequent seat is the head of the tibia, or the lower part of the femur. Mr. Stanley knows of only a single instance, in which it had occurred coincidently in more than one bone; and, in a large proportion of the cases in which amputation had been performed for it, there had been no return of the disease in the stump, or other part of the body. The general result of *post mortem* examinations has been such as to indicate a similar localisation of the disease. The few exceptions to this remark, at all events, do not materially affect the conclusion, that medullary disease, beginning in bone, is less apt to occur coincidently in other organs than when it originates in the softer parts, and that consequently its removal by amputation may generally be undertaken, with a fair probability of permanent benefit.* This last observation seems not to be applicable, however, to medullary tumors of the upper and lower jaw-bones, few experienced surgeons now venturing to undertake an operation for them in these situations, well knowing that a return of the disease would almost certainly ensue.

---

*Mayo, Op. cit. p. 18.

In relation to exostosis, I may here mention a case, that is sometimes met with, where a considerable swelling of a bone arises from the formation of hydatids in the cancellous texture. In the Medico-Chirurgical Transactions of London, are the particulars of an interesting example of this disease. The tumor, which was in St. George's Hospital, under Mr. Keate, was situated on the cranium, and occupied the greater part of the os frontis. At the time of attempting its removal, its exact nature was known: but, in performing the operation, a collection of hydatids was discovered between the tables of the skull, and before they were completely extirpated, and the patient cured, repeated operations, and the application of the strongest caustics were necessary.

Pulsatory tumors. In my Dictionary the earliest notice was taken of cases in which tumors occur in bones attended with throbbing, and even followed by a spontaneous fracture of the osseous texture. The subject has been particularly considered by Dupuytren and Breschet, both of whom describe such swellings as consisting in the growth of a morbid erectile tissue, like what composes certain nævi, or aneurisms by anastomosis. Dupuytren remarks, however, that the tumor may be partly formed of other substances, especially the encephaloid, or medullary. Sometimes it is rather a slight thrill that is felt in the tumor, than a distinct pulsation; but in other instances, the throbbing is so strong, as to lead surgeons to mistake the disease for aneurism, and even to tie the great artery of the limb. The investigations of Mr. Stanley prove that pulsation occurs in tumors of varied character. The majority of those, which he has himself examined, consisted of medullary matter; but one which originated in the humerus, and pulsated strongly, was composed of firm gelatinous matter, which formed the walls of a cyst, about half an inch thick, and containing serous fluid. In one, recorded by Dupuytren, growing from the tibia, the morbid structure consisted of cells containing a gelatinous matter. In some of those related by Dupuytren and Scarpa, the pulsating tumor consisted of a sac, filled with coagulated blood and layers of fibrine; and in the sides of the sac were numerous dilated arteries, presenting open orifices upon its internal surface. In these instances it was supposed that the current of blood from these arteries into the sac might have produced the pulsation; but, in the greater number of pulsating tumors, growing from bones, no such change in the arteries can be found to account for this symptom. In all the specimens which Mr. Stanley had examined, the walls of the bone were absorbed between the tumor and the contiguous large artery, so that, on the outer surface of the tumor, there were either no remains of the bone, or so thin a layer of it that the impulse communicated by the artery to the tumor could be felt at every point of its surface. One varity, recognised by Mr. Stanley in four cases, consists chiefly in an enlargement of the arteries of the medullary membrane, accompanied by absorption of the interior of the bone, and simultaneous deposit of bone externally, so that the tumor is covered by a thin, more or less osseous shell. This is the disease regarded by Dupuytren and Breschet as corresponding to growths of morbid erectile tissue, and sometimes curable by ligature of the main artery, provided the operation be done before much destruction of bone has occurred. In one case, tying the femoral artery was followed by a permanent cure; in another, the same practice was successful for only seven years, at the end of which the tumor returned.

---

* E Stanley, Med. Gaz. vol. xx. p. 446.

Osteo-sarcoma is a term frequently employed, though rather vaguely; it is found to be a convenient name, because it suits any tumor, which consists partly of bone, and partly of a soft or fleshy substance: thus, medulary tumors of bones, when surrounded by, or interspersed with, osseous matter, have been sometimes described under the appellation of *osteo-sarcoma;* and so have fibrous, and fatty lardaceous tumors blended with osseous matter, or the remains of the original shell of the diseased bone.

Scrofulous caries of the spine, scrofulous disease of the heads of bones, anchylosis, and spina bifida, will be noticed in subsequent parts of this work.

DISEASES OF THE JOINTS.

Some diseases of the joints begin in the synovial membranes; some in the cartilages; and others in the heads of bones. The commencement of disease in the ligaments appears to be a rare occurrence: Sir Benjamin Brodie states, that he has never known it proved by dissection. Mr. Aston Kye refers to some instances, in which the ligamentum teres was implicated in a very early stage of the morbus coxarius; though here the disease probably began in the synovial membrane. Some syphilitic pains in the joints are suspected to arise from an affection of the ligaments; and it is believed, that the obstinate effects of many severe sprains depend upon a slow inflammation of the ligaments, the consequence of their having been ruptured, or over-stretched.*

INFLAMMATION OF THE SYNOVIAL MEMBRANES.

This may arise as an effect of phlebitis, gout, rheumatism, derangement of the constitution by mercury, or by the poison of syphilis. With the exception of the case originating from phlebitis, we must agree with Sir Benjamin Brodie, that inflammation of the synovial membrane from constitutional causes is generally less severe than other forms of it; for, though it produces an increased secretion of synovia, there is usually no effusion of fibrine, nor any material thickening of the synovial membrane itself. Sometimes it attacks several joints together, and even extends to the bursæ mucosæ and sheaths of the tendons; while, in other instances, it attacks different joints one after another. Frequently inflammation of the synovial membranes is entirely a local disease, excited by mechanical injuries of the joints, as sprains, contusions, wounds, dislocations, or fractures of the heads of the bones. The danger of a wound of the synovial membrane, depends, first, on the size of the joint; secondly, on the extent of the laceration or rent in the synovial membrane and integuments together; for where the former alone is torn, as in a simple dislocation, or where the opening in it is speedily covered by the integuments, the danger of severe consequences is infinitely less, than in the opposite circumstances; thirdly, on the degree of contusion and laceration of the synovial membrane, in addition to the mere solution of continuity in it, forming a communication between the cavity of the joint and the external wound. Wounds of the knee-joint from gunshot are sure to be followed by so dangerous a degree of inflammation of the synovial membrane, and such constitutional derangement, that the rule of practice in such a case, is to perform amputation without delay, before inflammation and its consequences on the part and the system at large have had time to come on. But a clean incised wound, or even a fine puncture gently made with a lancet, or couching needle, and so as to admit of being immediately afterwards covered with the integuments, may not be followed by any bad symptom whatever, more especially if care be taken to keep the joint quiet, and to employ antiphlogistic means. It is the knowledge of this fact, which encourages surgeons sometimes to cut into the knee-joint, either for the purpose of discharging fluid, or of extracting loose cartilaginous bodies, which, acting as extraneous substances, excite frequent attacks of pain, swelling, and lameness.

---

* See Sir Benj. Brodie's Pathological and Surgical Obs. on Diseases of Joints. 3d ed. p. 5. 8 vo. Lond. 1834.

Exposure to cold is the most frequent cause of inflammation of the synovial membrane, and the knee, as being less covered by muscles, is more subject to the effect of atmospheric influence, than the hip or shoulder. Sir Benjamin Brodie observes, that the disease seldom attacks young children, becomes less rare as they approach the age of puberty, and is most frequent in adult persons. The disease begins with pain the joint, which is generally most severe at one point, and attains its greatest height in a week or ten days. In a day or two after the commencement of the pain, the joint becomes swollen. At first the swelling arises altogether from a collection of fluid, which in the superficial joints may be felt to undulate. In time, however, the fluctuation is less manifest, because the synovial membrane is now thickened, or lymph is effused from its inner or outer surface. As the swelling in the early stage arises principally from the distension of the synovial membrane, its shape is very much regulated by the situation of the ligaments and tendons, which resist it in certain directions and allow it to take place in others. Thus, as Sir Benjamin Brodie has explained, in the knee, the swelling is chiefly on the anterior and lower part of the thigh, under the extensor muscles, where there is only a yielding cellular structure between these muscles and the bone. It is also considerable in the spaces between the ligament of the patella and the lateral ligaments. In the elbow, the main swelling is above the olecranon.

When, after the absorption of the fluid, and the subsidence of the pricipal swelling, the synovial membrane continues thickened, it sometimes happens, as Sir Benjamin Brodie observes, not only that a certain degree of inflammation lingers in the part, but ulceration may take place in the cartilages, suppuration ensue, and the articulating surfaces be completely destroyed.

The following statement from the same authority deserves attention: in syphilitic cases, it seldom happens that more than one or two joints are affected at the same time. In the early stage of syphilis, the inflammation is usually an accompaniment of a papular eruption or lichen; there is then but little pain; fluid is effused only in small quantity, and when this has been absorbed, the joint is restored as nearly as possible to its original condition. In the more advanced stages of syphilic, we find inflammation of the synovial membrane existing in combination with nodes; and then it is productive of much greater inconvenience, and is more difficult to cure; and the synovial membrane is left thickened, and the joint larger than natural, after the fluid has been dispersed. On the other hand, in rheumatism, several joints are mostly affected, either at the same time, or in succession; and the bursæ mucosæ and sheaths of tendons are often involved. There is usually a good deal of pain and and swelling, and the joints are frequently left stiff and enlarged after the attack. When the inflammation is connected with gout, the pain is generally excessive, compared with the other symptoms.

The treatment of inflammation of the synovial membrane, varies according as it may be acute, or chronic, or local or constitutional affection.

In the acute and local form of the complaint, perfect quietude, leeches, venesection, repeated according to circumstances, saline purgatives, and diaphoretics, are required. If the skin be very tense, fomentations and poultices will be the best applications; but, otherwise, cold evaporating lotions.

In chronic cases, the taking away of blood from the part, by means of leeches, or cupping, quietude of the joint, and cold evaporating lotions, are the best measures. Afterwards, when the inflammation has been in a great measure subdued, blisters become useful, either applied in succession, or kept open with savine cerate. In a still later stage, stimulating liniments, as the ointment of tartarized antimony, that of the hydriodate of potash, or camphorated mercurial ointment.

When patients are so far recovered, that they cannot be prevented from moving about, though the joint will not yet bear much exercise with impunity, its motions should be moderated by the application of circular straps of adhesive or soap-plaster, and a bandage, or it may be covered with a kind of cap made of leather, or other elastic materials, and laced, or buckled on the joint.

Amongst the means employed for the removal of stiffness, and thickening of the soft parts, left after synovial inflammation, friction made by the hand with hair powder; the pumping of water, cold or warm, from a height of several feet; the vapor bath; and champooning; deserve to be mentioned.

When inflammation of the synovial membrane arises from rheumatism, and especially when several joints are attacked, local or general bleeding, followed by the exhibition of purgatives, pulv. ipec. comp., or the wine, or acetous extract of colchicum, will be the most successful means. When the inflammation affects only one or two joints, calomel combined with opium is the best medicine. There is also a case, which begins with acute inflammation of the periosteum of the femur, then involves the synovial membrane of the knee, and may advance to ulceration of the cartilages: this is an example, particularly pointed out as one demanding the exhibition of one or two grains of calomel, with a quarter, or half a grain of opium every six hours, to which also two grains of antimonial powder may be sometimes added.* In other cases, arising from syphilis, a well-regulated course of mercury is necessary; and when the disease has been excited by the abuse of that mineral, or is conjoined with disease of the bones and periosteum, the iodide of potassium with sarsaparilla may be prescribed.

EXTRANEOUS, CARTILAGINOUS, OR OSSEOUS SUBSTANCES IN JOINTS,

Are more frequent in the knee than any other joint, but they occasionally present themselves in the elbow, ancle, and articulations of the lower jaw. It is only in the knee that they become objects of surgical attention. Sometimes they are quite detached from the synovial membrane; sometimes connected with it by a narrow pedicle. They have a glistening pearly lustre, and mostly consist of a cartilaginous substance, with osseous matter in its centre, and a firm capsule investing their outer surface. Sometimes the joint contains only one body of this description; sometimes as many as twenty or thirty. They are usually convex on one side, and concave on another, and more or less oblong. Sometimes they are not larger than a pea; in other instances, nearly equal in size to the knee-pan itself.

So long as these cartilaginous formations retain an attachment to some point of the articular cavity, and are thus kept in one situation, they give no inconvenience; nor even when loose, do they cause any annoyance, unless they happen to be pinched between the articular surfaces of the bones. When this occurs, the patient is suddenly seized with excruciating pain, and is immediately deprived of the use of the limb. These attacks are frequently followed by more or less inflammation of the synovial membrane, and effusion of fluid in the joint. The patient is then obliged to confine himself to his bed for a few days, till the tenderness and swelling subside, after which he returns to his usual occupations; but his knee remains weak, and attacks of the same kind returning from time to time, he finds it necessary to consult a surgeon.

With respect to the manner in which these moveable cartilages are produced, one explanation of it is, that they derive their origin from the synovial membrane, which, in consequence of inflammation, throws out fibrine, and this becoming organized, is at length converted into cartilage or bone. By degrees, however, it is more or less loosened by the movements of the joint, and often completely detached. When this has happened, the new cartilaginous formation never afterwards increases in size; but, by changing its situation, and getting between the condyles of the femur, and head of the tibia, in the motions of the joint, it causes severe pain and lameness. In France, an opinion prevails, that the new substance is first formed in the cellular tissue on the outside of the synovial membrane, or else between the fibres of the synovial membrane itself; that, in the former circumstance, this membrane is pushed inwards, and that a part of it constitutes the pedicle, which at length gives way, and leaves the new formation quite loose in the cavity of the joint. It is possible, however, as Cruveilhier thinks, that they may not always form in one manner; for, in one case, he found one loosely attached to the tibia, and under the synovial membrane. It is also generally admitted, that portions of the natural articular cartilages may sometimes be broken off.

---

* Cæsar Hawkins in Med. Gaz. vol. xii. p. 652.

In the majority of cases, met with by Sir Benjamin Brodie, no symptoms of inflammation preceded their formation, and hence, he believes, they are often generally like other tumors. "They appear (says he) to be situated originally either on the external surface, or in the substance of the synovial membrane, since, before they are detached, a thin layer of it may be traced upon them. He met with two cases, in which, from some morbid action, a bony ridge was formed, like an exostosis, round the margin of the cartilaginous surface of the joint, portions of which ridge broke off in the motions of the joint over them.

Treatment. Whether these substances should be taken out, or not, depends on two circumstances; first, on the degree of annoyance suffered by the patient; and, secondly, on his willingness to encounter an operation, when the risk of it has been fairly and correctly explained to him; for, it must not be dissembled, that some individuals who have submitted to the operation, have had severe inflammation of the joint brought on by it, and have lost their lives. They therefore sacrificed themselves to an experiment, made in the hope of being relieved from what is commonly a very endurable complaint. But, supposing a person were to be prevented from getting his bread by this disease, and were not only willing, but desirous to submit to the operation, after its danger had been rightly explained to him, and a bandage of laced knee-cap had failed to give him relief, then I should say, that the operation ought to be performed. I once attended a gentleman who had a large cartilaginous substance loose in the cavity of the knee-joint, which prevented him from following his affairs; he used to be attacked with inflammation of the synovial membrane every two or three weeks. I explained to him the risk attending the operation, but he chose to encounter it, and fortunately he got well without a single bad symptom. The cartilaginous formation was half as large as the patella, with one side convex, the other concave. In the operation, it is a good plan not to make the incisions through the skin and synovial membrane exactly opposite one another. The integuments should be drawn to one side, and then cut through; and thus, when the integuments, with the synovial membrane, resume their natural place, the aperture in the latter texture will be closed. The situation, often considered most convenient for the operation, is over the internal condyle; here we may try to fix the foreign body, and after having exposed it, we are to take hold of it directly with a tenaculum, lest it slip away into another part of the joint, whence we may not be able to remove it so as to bring it out of the wound. As there is a risk of inflammation after the operation, it is always prudent, for two or three days before it is undertaken, to keep the patient in bed, or perfectly quiet in his room, to restrict him to a low diet, and to give him an aperient mixture. Above all things, we should never operate while the joint is at all hot, painful, or disposed to inflammation. If inflammation come on after the operation, we must trust to copious and repeated bleeding, leeches, mercury, purgatives and cold applications. Supposing the cartilaginous substance were rather large, we ought not to force it through an insufficient opening in the synovial membrane; for this would be far more likely to bring on inflammation, than if we were to enlarge the wound. This should not, however, be made any larger than actually necessary, as the danger of wounds of the knee is in a great measure in proportion to their size.

PULPY THICKENING OF THE SYNOVIAL MEMBRANE.

Another disease of the synovial membrane, called the *pulpy thickening of it*, is a disease generally reputed to be of a scrofulous nature. Not many years ago, many very different complaints were all confounded together under the name of *white swelling;* thus, chronic inflammation of the synovial membrane; a disease beginning with ulceration of the cartilages; a scrofulous disease, commencing in the heads of the bones; and this pulpy disease of the synovial membrane, were all jumbled together under the head of white swelling. The disease, which I now wish to describe, occurs chiefly in young persons, or individuals between the ages of sixteen and twenty-two or twenty-five; and is mostly met with only in the knee. At first, the pain is inconsiderable, merely amounting to a stiffness, accompanied by a slight swelling and rigidity. The disease, therefore, comes on slowly and insidiously. By degrees the swelling increases, and, on touching it with the finger, we find that it communicates a sensation as if it contained a fluid, there being considerable softness and elasticity about it. In time the joint is nearly destroyed. Yet the pain is not very severe; indeed, it occasions no great suffering till abscesses form in the synovial membrane, or on the outside of it. The disease may go on for several years without rendering amputation necessary; it is one of those tedious diseases, in which the patient lingers a long time without getting well, and yet without being reduced to such a state as absolutely to be obliged to submit to amputation. At last, however, the hectic symptoms become aggravated, and amputation is unavoidable. According to Sir Benjamin Brodie, who first discriminated in this case from other forms of disease classed as white swellings, it is incurable, inasmuch as it consists in a total disorganisation of the synovial membrane, which is converted into a brownish or lightish brown pulpy substance, varying from a quarter to half an inch or more in thickness. It is then an organic disease, and white lines may be seen crossing the pulpy substance in various directions. In its advanced stages, the cartilages, ligaments, and bones of the joints become diseased, or destroyed. Generally, the whole synovial membrane is changed in the manner described: but in a few instances only a portion of it is attacked. In the majority of cases, we may recognize this disease by the very gradual progress of the enlargement of the joint, the stiffness without pain, and the soft elastic feel of the tumor:—such are the characteristic marks of the pulpy thickening of the synovial membrane.

Treatment. Mr. Syme, who considers the disease not totally incurable, recommends quietude of the joint, which is to be maintained with the assistance of pasteboard or splints. This principle applies to all chronic diseases of the joints. He also puts the patient on a regimen calculated to improve his general health. If there be inflammation in the part, he attacks it by means of leeches, cupping, &c., and with the view of promoting the absorption of the pulpy substance into which the synovial membrane is converted, he recommends blistering the part, and the application of iodine preparations, or iodine with mercury, and the ointment of iodide of potassium.

Mr. Scott adopts a particular mode of dressing diseased joints: he surrounds the joint first with soap plaster, blended with mercurial ointment, over this he applies straps of emplastrum plumbi, and then common soap-plaster spread on thick leather. Whatever efficacy this method may possess is owing, I conceive, not to the mercury, nor to the particularity with which the dressings are put on, but to their effect in keeping the joint motionless. No doubt, the keeping of the joint motionless is one of the most important means in the treatment of the disease, and whether we adopt Mr. Scott's method, or use common splints, either plan will answer the same purpose. When there are abscesses, pasteboards or splints seem preferable to a mass of materials, which are to be removed only once a week, and under which a great deal of filthy discharge would accumulate.

Some diseases of the joints are alleged to begin in the cartilages. *Ulceration of the cartilages* is more commonly noticed in adults than the pulpy thickening of the synovial membrane. It is not very easy to discriminate the incipient stage of ulceration of the cartilages from chronic thickening of the synovial membrane. In the early stage, there is generally no enlargement of the joint, but, after the disease has made some progress, the synovial membrane begins to be inflamed, and the case is then accompanied by swelling. Generally, however, for the first few weeks, there is little or no swelling; nor is any serious degree of pain experienced in the beginning of the complaint, unless the joint be exercised. Certain other forms of disease in joints are seen, in which there is constant pain, whether the limb be moved or not. At night, however, some pain usually accompanies the present affection; and, after a time, the synovial membrane becomes affected, and then, in addition to the ulceration of the cartilages, there is an effusion of fluid in the joint, which adds considerably to the swelling, and occasions a fluctuation. The latter circumstance may therefore be considered as sometimes constituting one of the symptoms of the disease. Almost all the surgical diseases of the joints have a tendency to terminate in suppuration and abscesses both within and without the synovial membrane, followed by fistulæ and sinuses, as well as caries of the bones; so that, unless we examine the disease in an early stage, we may not always be able to pronounce exactly in which texture it has commenced. When abscesses form in the disease now under our consideration, the matter collects in the synovial membrane, and also ultimately in the cellular tissue on the outside of the joint, frequently spreading to a great extent under the thickened integuments, and at length making its way out by one or several fistulous ulcerations.

Professor Cruveilhier * and Mr. Key believe, that inflammation of the synovial membrane is the most frequent cause of ulceration of the cartilages. Some of the cases to which the latter refers, prove the existence of a long-continued synovial affection, before any ulceration of the cartilaginous surface could have taken place; for, in them the cartilage was quite sound, with the exception of a slight loss of substance at the edge of the bone, where the synovial membrane was reflected from it, though the symptoms of diseased joint had existed for many months, with pain over a large part of the synovial surface, and general swelling of the joint. According to Mr. Key's investigations, the inner part of the knee-joint, usually exhibits the most extensive ulceration, on account of the oblique bearing of the femur, and its unequal pressure on the inner part of the head of the tibia. Hence the inner semilunar cartilage is oftener destroyed than the outer one, and there is a corresponding destruction of the cartilage covering the inner condyle of the femur and inner part of the head of the tibia. The patella and extremity of the femur are stated by Mr. Key to be the parts on which the ulcerative process can be best traced, on account of the disease being less advanced in them. In the former bone, the part which first commonly ulcerates, is the margin of the cartilage where the synovial membrane is reflected from it. At this point, Mr. Key describes grooves of different depths as being formed, which cannot be always distinguished, until the thickened edge of the synovial membrane is raised. The ulcerated surface sometimes exhibits parallel vascular lines, verging towards the centre, and having their origin from the synovial membrane, which, if the vessels are well filled with fine injection appears highly vascular and fringed, or villous, like a mucous membrane. This highly vascular fringe of membrane, described also by Cruveilhier, is a newly organised, and, as Mr. Key conceives, sometimes a superadded structure for the purpose of producing ulceration of the contiguous cartilage. When recently formed, some parts of it may be raises from the synovial membrane, but it adheres very slightly to that part of the cartilage where ulceration is going on: indeed, according to Mr. Key, this adhesion will not be perceived, unless the joint be opened with care. It seems, therefore, from these interesting researches, that the process, by which the ulceration of cartilage is here effected, is analogous to that by which the sequestrum of the cylindrical bones in necrosis takes place. The cartilage, indisposed to ulceration from the low degree of its organisation, is acted upon by the newly organised synovial surface, which is rendered highly vascular, and forms a groove in the edge of the cartilage, by means of its villous processes. We also learn from Mr. Key's investigations, that the granulations which sometimes arise from the surface of the exposed bone, assist the membrane in the work of absorption. The formation of the vascular membrane frequently takes place without suppuration, as may be seen in strumous joints that have been the subject of chronic inflammation for years, without abscess having formed; and the inflammation is sometimes confined to one side of the joint.

---

* Anatomie Pathologique, fol. livraison 6.

The second mode, adverted to by Mr. Key, in which nature effects the ulceration of cartilage, without the agency of its own vessels, is exemplified where suppuration follows acute inflammation, from a wound of the synovial membrane, which then undergoes a change, enabling it to perform its new function. Its surface becomes highly vascular, and, in most parts, covered with a new deposit of adhesive matter which is in many parts villous, or furnished with vascular fringed projections. In a joint, thus far advanced in disease, Mr. Key considers that the only mode of arresting the disorder, or of repairing the mischief, occasioned by inflammation, consists in the production of anchylosis. To this end, the removal of the cartilage is an essential step; and it would appear, that the office of removing it devolves on the inflamed synovial membrane. The absence of all action in the cartilage, and a total want of vascularity in those parts, where ulceration appears to be most active, were the circumstances which first led Mr. Key to look for some agent in the work of ulceration. The ulceration, as he explains, evidently begins on the surface of the cartilage, and not on that side next to the bone. It presents merely an eroded surface; there is no disorganisation of its texture in the parts where absorption is about to take place. The grooves are formed only in those parts of the cartilage, which happen to be opposed to the fringed and vascular synovial membrane. The removal of the cartilage, which is an impediment to anchylosis in many diseased conditions of joints, is what nature commonly aims at. In the most chronic form of strumous ulceration, the removal of the cartilage is accomplished, according to Mr. Key's researches, by the gradual development and organisation of the synovial membrane, where it is reflected from the edge of the cartilage. Where the process is required to be more rapid, a false membrane is effused from the edge of the synovial membrane, that gradually diffuses itself over the whole surface of the cartilage, and, by means of its increased vascularity, ulcerates the cartilage even to the bone, anastomosing often with the granulations of the exposed cancellous structure.

Another case is where ulceration begins on the surface of cartilage attached to the bone. In examples of chronic disease in the cancellated structure, Mr. Key finds, that, when the cartilage begins to give way, vessels can be seen shooting towards it, and accumulating in sufficient number to form a vascular tissue, covering the attached surface of the cartilage. Afterwards, when the ulceration has proceeded through the cartilage, or nearly so, into the joint, the synovial membrane inflames, and the ulcertion is then forwarded by a similar process, commencing at the edge of the cartilage, by means of the synovial membrane, and newly developed vascular structure. In accute inflammation, attacking the spongy extremities of bones, the osseous substance is said by Mr. Key not to be softened, but to retain its firmness of texture, and exhibit no marks of disease, except at one part of the cancelli. Here a cavity is found, containing one or more portions of detached bone, surrounded with pus. This cavity communicates with the joint by a fistulous opening of small size. The process of ulceration evidently begins on the outside of the joint, for the cartilage seems undermined, and its articular surface perfectly sound, while the synovial membrane itself is acutely inflamed, and its cavity has communications with one or more extensive collections of pus above and below the joint.

These pathological researches, undertaken by Mr. Key, harmonising as they do with those of Cruveilheir on the same subject, seem to be well deserving of attention, and calculated to throw light on the difficult and obscure subject, of the theory of ulceration in general. From Sir Benjamin Brodie's work, I find that he was aware, many years ago, of some facts relative to this doctrine, which, however, he does not adopt.

The cartilage, covering the articular surface of the bone, being once destroyed, is reproduced with great difficulty: indeed, when cartilages are destroyed, and caries has attacked the subjacent bone, the disease must either terminate in anchylosis, which is, under such circumstances, the most favorable termination that can take place, or in a porcelainous or ivory-like deposit on the surface of the part from which the cartilage has been removed. In many instances, when the disease is in the knee, ankle, or elbow, hectic symptoms may begin even before suppuration commences, and especially when the disease is in the knee, though it rarely happens, that amputation is rendered necessary by constitutional disturbance under such circumstances.

In the *treatment* of this form of disease of the joints, one obviously essential plan is, to keep them as quiet as possible; for every movement occasions a disturbance of the textures affected; and when the cartilages are ulcerated, friction of them must be particularly injurious. The treatment, then, consists in keeping the joint quiet, not only by making the patient observe the recumbent position, but also by the use of splints, or pasteboard, or by the method of strapping and bandages recommended by Mr. Scott. Another indication is, to endeavor to stop the morbid process, which, through the agency of the synovial membrane, and the new vascular substance developed from it, is occasioning the ulceration of the cartilage. For this purpose, experience has not furnished us with any means more effectual than the counter-irritation by means of blisters, issues, moxa, or antimonial ointment. However, this observation is to be received with some degree of limitation; for in this, as well as in other diseases of the joints, there is often at first acute inflammation present, the part being painful and hotter than usual, from not having been kept quiet. Under these circumstances, it will be proper to employ common antiphlogistic means, previously to counter-irritation. On the Continent, and also in the surgical schools at Edinburgh, the cautery is sometimes recommended, as a means of producing counter-irritation, in the treatment of diseased joints; but in England surgeons rarely or never resort to it. Here we dislike heated irons as implements of surgery, which may be looked upon, perhaps, as mere prejudice, because no doubt is entertained of their frequent efficacy. They are, what the French term, *heroic* remedies. After the morbid action has been in some degree stopped, we may try other plans, such as pumping cold or warm water on the part from a height, as practised at some of the watering places. If the disease be arrested in time, the cure may take place without any material loss of cartilage, or consequent anchylosis, and after a period has been put to the disease, if there should still remain some uneasiness and weakness in the joint, we may try pumping water on the part from a height, or champooning, or mere friction with the hand or with hair-powder. Anchylosis, however, is the common termination of this disease, and with this view it is, that nature takes away the cartilage. The application of steam to the part is a beneficial plan, where anchylosis can be avoided, for it promotes the restoration of the functions of the joint, and tends to obviate the stiffness, which is apt to continue a long while after the disease has stopped. Dr. O'Berine has published several interesting cases, in order to prove the great usefulness of mercury in ulceration of the cartilages of joints. To scrofulous patients, laboring under this disease, he administers the infusion of sarsaparilla in lime-water, is the best medicine for preventing the injurious affects of mercury on their constitutions.*

SCROFULOUS DISEASE OF JOINTS, BEGINNING IN THE BONES.

Another form of *disease* of the joints, is that in which the affection *begins in the cancellous texture* of the heads of the bones, often set down as *scrofulous*. All the joints are more or less liable to it; but the ankle, knee, and elbow, are those in which it occurs with particular frequency. When the knee is the part affected, there is considerable pain about the head of the tibia, or in the centre of the joint, followed by a general enlargement of it. In consequence of the swelling of the part, and a degree of emaciation, which takes place in the limb above and below the joint, it seems as if the heads of the bones were enlarged; but experience has proved that such is not really the case, and that the appearance depends on the emaciation of the leg and thigh, and the thickening of the synovial membrane and parts external to it. This scrofulous disease of joints is remarkable for the great length of time, during which the skin retains its natural color; hence, indeed, the term *white swelling*. Ultimately, however, the skin becomes tense and shining, and streaked with dilated tortuous veins. In this stage, the joint will also generally be noticed to be above its natural temperature. Frequently before the disease has advanced to suppuration, the joint cannot be bent and extended, but becomes permanently fixed in one position. Thus, when the knee is affected, it becomes generally more or less bent, and cannot be straightened; frequently it is quite bent, and the patient has no power to change its position.

---

* See Dublin Journ. of Med. Science, vol. v. p. 159.

In time, matter forms in the cavity of the joint, and makes its way by ulceration through the synovial membrane, or abscesses sometimes form on the outside of the joint. Then the cartilages are destroyed, and several fistulous apertures take place about the knee, through which the matter is discharged. Sometimes sinuses occur, and run to a considerable distance from the joint under the fascia or between it and the skin. When a joint in this state is examined after amputation, besides ulceration of the cartilages, and inflammation and thickening of the synovial membrane and of the cellular tissue external to it, we find the heads of the bones softened and weakened in their texture, in which is deposited a soft substance, of a caseous yellow appearance, seemingly in the very tissue of the bone, the phosphate of lime being partly absorbed, and this new softer substance secreted in lieu of it. In many scrofulous bones, a considerable deposit of bony matter takes place on their outside, in very irregular forms, and sometimes in the shape of spiculæ or icicles. Whenever we amputate scrofulous joints, we mostly see these irregular bony deposits. They are, as I have said, sometimes very much like icicles, or stalactical processes, and very sharp.

The scrofulous affection of the heads of the bones is, perhaps, more difficult to cure than the generality of diseases of the joints, excepting the organic change, or pulpy thickening of the synovial membrane. The disorder, indeed, is connected with a scrofulous constitution, the rectifying of which is no easy task. However, this must be attempted by means, which will be described when I come to the subject of scrofula.

In the treatment of scrofulous disease of the joint, commencing in the heads of the bones, we are to keep the part perfectly motionless: this principle applies, as I have before observed, to all diseases of joints. The object is effected either by means of long straps of plaster, by Mr Scott's plan, or by the use of splints. When there is a tendency in the limb to assume a posture, which would let it be of little use to the patient in case of anchylosis, we should endeavor to counteract such tendency with the aid of splints. In addition to these means, blisters should be applied to the joint, and kept open with savine ointment. Or we may employ the antimonial ointment, issues, noxa, and other counter-irritants, which form the common mode of practice. But whenever the joint is affected with a degree of acute inflammation, we should defer or discontinue the counter-irritants, and trust chiefly to quietude and antiphlogistic measures till the inflammation has subsided, When the diseased process has been arrested by the above methods judiciously put in practice, champooning may be had recourse to, or water allowed to fall upon the part in a column from a considerable height, which plan is to be persevered in for a certain time every day. It is always a rule in the treatment of this disease to open abscesses early, and when anchylosis is likely to take place, the joint should invaribly be placed in the posture most likely to let the limb be of the greatest service to the patient.

COXALGIA, OR SCROFULOUS DISEASE OF THE HIP JOINT,

Is generally supposed to commence in the cartilages; but this is, perhaps, rendered doubtful by the tenor of Mr. Key's investigations, whence it would seem that cartilage is not susceptible of any primary morbid change itself. Sir Benjamin Brodie's observations tend to prove, that in many cases, the cartilages are, at all events affected in a very early stage. Mr. Key's dissections lead him to believe, that the ulceration of the cartilage is preceded by inflammation of the ligamentum teres. In one case, the ligamentum teres was found much thicker and more pulpy than usual from interstitial effusion; and the vessels upon its investing synovial membrane were distinct and large. At the root of the ligament, where it is attached to the head of the femur, a spot of ulceration of the cartilage was seen, commencing, as it does in other joints, by an extension of the vessels in the form of a membrane from the root of the vascular ligament. The same process was also taking place in the acetabulum, where the ligamentum teres is attached. That the synovial membrane of the hip-joint, and not the cartilage, is often primarily engaged in this disease, appears to Mr. Coulson deducible from one of the first symptoms which marks its commencement, viz., a fulness of the groin, depending, in all probability, upon the increased secretion into the joint, similar to what is known to take place in synovitis of the knee.* It is not to be supposed, however, that sir Benjamin Brodie it unaware of the fact, that ulceration of the cartilages of joints is often preceded by synovial inflammation; on the contrary, he distinctly states, that he has known many cases in which there was evident destruction of the cartilages of a joint by ulceration, manifestly arising from neglected inflammation of the synovial membrane. "When inflammation attacks the synovial membrane of the hip, there is (says he) an evident fulness of the groin, and, in some instances, of the nates also. The pain is aggravated when the patient stands erect, and allows the limb to hang without the foot resting on the ground. It is also increased by motion, but not by pressing the articular surfaces against each other, so that it does not prevent the weight of the body from being borne by the affected limb." Coxalgia is most commonly met with in children between the ages of seven and fourteen; though occasionally at an earlier, and also at a much later period of life. One of the first symptoms is pain about the knee-joint, and sometimes there is more uneasiness felt there, than in the hip-joint itself. The pain generally shoots downwards along the inside of the leg, as far as the instep. The pain is so much complained of in the knee, that nurses and careless practitioners often apply poultices to that joint, without even suspecting that the hip is the true seat of disease. If, however, the surgeon press upon the joint, anteriorly, or posteriorly, or grasp the foot and rotate the head of the femur against the acetabulum, the pain, thus excited, soon apprises him, that the real seat of disease is the hip. The next thing usually noticed is, that the patient feels weakness and stiffness in the joint, and cannot walk his usual distances without great fatigue, and uneasiness in the limb; in fact he is soon observed to limp, and the limb to shrink and dwindle away. One remarkable symptom is, that the glutæus-maximus muscle on the diseased side is much flattened, and its lower margin less prominent, than that of the corresponding muscle on the opposite side. Hence, when any doubt exists about the nature of the case, we should never omit to examine the posterior appearance of the pelvis and muscles attached to it; and then, if the disease be coxalgia, we shall observe that difference between the glutæi muscles which I have described, viz., the glutæus maximus on the diseased side will be fattened, and its lower margin, instead of being prominent and conspicuous, will be almost effaced. In the early stage, the patient inclines his thigh forwards, and, when in the same stage of the disorder, we examine the patient as he lies on his back, it appears as if the affected limb were longer than the other. If the patient stand up, we observe that he does not rest equally on both feet. The sound limb is extended while the affected one is bent, the knee being lower than that of the opposite side; and the foot generally everted, though it is occasionally turned inwards.* At the present day, most surgeons ascribe the lengthened appearance of the limb to the position of the pelvis being altered; for, in order to save the limb as much as possible, the patient keeps it suspended, and the weight of it has the effect of drawing that side of the pelvis lower down than the opposite side. Therefore, when we examine the two limbs, in the recumbent position of the patient, the diseased limb appears the longest, because the acetabulum is lower than natural, and the posture of the pelvis oblique. This alteration in the position of the pelvis even affects the spinal column more or less; and, we find, that it is also more or less distorted by the efforts made to counterbalance the weight of the suspended limb. In addition to the change in the position of the pelvis, Mr. Coulson conceives, that the limb is really a little lengthened, or rather the trochanter major is slightly protruded. However, there is one resistance to such protrusion, that has been adverted to only within a recent period. Weber proved by experiments, that it was not simply the muscles and ligaments, as was formerly supposed, which preserved the head of the femur in contact with the acetabulum; but that the acetabulum being closed by the head of the bone in an air-tight manner, the femer was held suspended by the atmospheric pressure. Hence, all the muscles and ligaments about the joint may be cut through without the weight of the leg causing the head of the femur to recede in the slightest degree from the acetabulum; whilst, on the contrary, when all the muscles and ligaments are left entire, the head of the bone will sink from three to four lines out of the acetabulum, if the atmospheric pressure be permitted to act on the upper surface of the head of the femur, through a hole bored from the inside of the pelvis into the joint. By careful measurement of the space between the anterior superior spine of the ilium and the external malleolus, Fricke ascertained, that in *apparent elongation* of the limb, there was always *real shortening*, which amounted to nearly the same extent as the apparent elongation.* In a few instances, the affected limb, even in the early stage, does not appear to be longer, but shorter than the other. The cause (as Sir Charles Bell remarks) is the same in both examples: the patient seeks the position of ease. " If the patient be taken due care of, and be put to bed early in the disease, the leg will be shorter; but, if the disease be of a more chronic nature, so that the person is permitted to go about, the leg will be longer; for, in walking with an inflamed hip, the weight of the body must be thrown on the other hip, in order to relieve the affected joint; and the patient dare not bring the diseased hip exactly under the centre of the body, but he pushes it forward, whilst he bears on the other limb. This gives rise to a curve in the spine; and the limb is longer, owing to the position of the pelvis, which is poised differently; the diseased side being depressed, instead of being elevated, as in the other case."† As the disease advances, pain begins to be felt about the trochanter major, and also in the groin, and the suffering is greatly increased by eversion or abduction of the limb, a fact, which Mr. Key dwells upon, as corroborating his belief, that the disease begins with inflammation of the ligamentum teres; for those movements cannot be endured in the early stage, though flexion and slight inversion cause no complaint. He also deems the pain, felt on pressing the head of the femur against the acetabulum, another proof of the disease beginning with the inflammation of the ligamentum teres. In some cases, the disease does not advance to suppuration; the morbid changes cease; and a cure takes place, without the formation of any abscesses. Sometimes the disease terminates in anchylosis, also without suppuration. In other instances, abscesses form, and then the matter generally passes down behind and below the trochanter major, and often spreads to a great extent down the limb. Sometimes the abscess spreads upwards above the great trochanter, and around the pelvis. Such abscesses may burst in various places, and frequently there are several ulcerated openings, leading by fistulæ to the diseased hip. Sometimes the matter escapes by fistulous openings on the nates, or thigh; but, now and then, the acetabulum, becoming carious, an opening takes place through it, the matter thus finds it way into the pelvis, and, descending by the side of the rectum, bursts near the anus. One memorable case is recorded by Sir Charles Bell, in which not only were the acetabulum and the head of the femur injured by the effects of caries, as usually happens, but, after the disease had advanced to a certain extent, the remains of the head and neck of the thigh-bone passed through the carious acetabulum into the pelvis. In two specimens in the museum of University College, a portion of the head of the femur projects into the pelvis, in consequence of the injured state of the acetabulum. In the second stage of this disease, the acetabulum is either widened, or parts of its brim destroyed, while the head of the femur is more or less diminished, and both the ligamentum teres and the synovial membrane are sometimes nearly annihilated. Hence, the most frequent cause of the shortening of the limb, in the second stage of the disease, a shortening, not dependent upon actual dislocation, which, however, sometimes occurs, as was the case in a patient under my care last spring (1839) in University College Hospital, and the specimen taken from whom is now preserved in the museum of the same college.* The head of the bone then is sometimes truly dislocated by the action of the muscles on the dorsum of the ilium. In rarer cases, the upper end of the femur is drawn downwards and inwards on the foramen ovale. In still less usual instances, the head of the femur is displaced forwards, and rests on the pubes. Sir B. Brodie, in one case, found the head of the bone out of the acetabulum, yet within the capsular ligament. Dislocation may take place very suddenly, the limb becoming, all at once, three or four inches shorter than natural, with the toes turned most frequently outwards, but sometimes inwards. The examples, in which the foot and knee are everted, are those in which the head of the femur is totally destroyed, or separated from the rest of the bone, and the shaft drawn upwards; but, when the head remains, and is not totally destroyed or separated, the toes are turned inwards, unless the dislocation be forwards. Mr. Wickham gives an instance, in which both hip-joints had been diseased,

---

* W. Coulson, on Disease of the Hip-Joint, p. 32. 4to Lond. 1827.

---

* Coulson, Op. cit. p. 51.

---

* Many other ingenious remarks on this subject have been published by Dr. Gadechens, of Hamburgh; a translation of whose paper by Dr. Bigger is inserted in the Dublin Journ. of Med. Science, vol. xii. p. 409.

† Sir Charles Bell, in Med. Gaz. vol. xiv. p. 302.

---

* See London Med. Gaz. vol. ii. p. 255. New Series.

and in which the toes of each limb were turned out. This position he also regards as the invariable one, when a dislocation really happens; for in those cases, where the limb is inverted, he conceives that it is merely drawn across the other.* The view, which I have given, corresponds to that entertained by Sir Benjamin Brodie. In the advanced stage, attended with dislocation, the limb is not only sometimes shortened and turned either outwards, or inwards, but the thigh is considerably bent upon the pelvis. During these changes, the constitution suffers severely from hectic fever, and not unfrequently a fatal termination is the result. Carious disease of the hip-joint, attended with suppuration in the adult, is seldom cured. In a grown-up person, the prognosis is almost always unfavorable if abscesses take place; but children sometimes get through the disease, though suppuration be present. The degree of danger in these cases depends on several circumstances. First, on the extent of the disease in the bone; in some instances, which I have dissected, a considerable portion of the ossa innominata (and not merely the acetabulum and head of the thigh-bone) was diseased and carious. I have seen the os ilium extensively diseased; so that a great deal must depend on the question, how far the disease of the bones has reached. Secondly, much will depend on the size of the abscesses; when there is no suppuration, the danger is less considerable, and then even an adult may recover. It is curious to find, that sometimes the case will advance to the stage of dislocation, though no abscesses have occurred. This happened in the remarkable case, which I have quoted from Mr. Wickham's publication. Thirdly, the degree of hectic disturbance influences the prognosis; and so does the age of the patient: because, if he be an adult, and abscesses take place, he will have but little chance of recovery. Many children who die of this disease, have pulmonary tubercles: I attended, with Sir Astley Cooper, a young lady at Walthamstow, who died with disease of the hip, and, on opening her chest, numerous tubercles were found in the lungs. Another patient of mine had a vast accumulation of serous fluid in the abdomen before death.

Dissection reveals appearances of the following kind: The synovial membrane and capsular ligament exhibit the effects of inflammation, being thickened, and occasionally perforated at various points. Frequently the synovial membrane is lined with fibrine, or filled with thick purulent matter. Sometimes it is converted into a gristly substance. In the progress of the disease, it is often completely destroyed. The ligamentum teres is ulcerated; but, in advanced cases, not a vestige of it may remain. The cartilages are abraded in some parts; and absorbed in others. "Sometimes that of the acetabulum is first affected; sometimes that of the femur; and sometimes ulceration begins in both at the same time. As the disease proceeds, these cartilages are completely destroyed, and occasionally replaced by an ivory, or almost vitreous deposit. Loose floating portions of cartilage are occasionally found in the joint after death. Cruveilhier relates a case, in which he found fifteen loose fragments of cartilage in the hip-joint. The cotyloid and transverse ligaments are generally destroyed.

---

* On Diseases of the Joints, p. 160. 8vo. Winchester, 1833.

"The socket is widened, and rendered shallow by this process; the bare surfaces of the bone becomes carious; and the head, and even the neck, of the femur is lessened. In scrofulous inflammation of bone, the earthy matter becomes absorbed, and the bone consequently softened; whilst the cancelli are filled with a yellow carious matter, or a transparent yellow fluid. But (according to Mr. Coulson), the striking feature in this kind of inflammation is the absence of all secretion, or deposit of bone; whereas, in simple inflammation, uninfluenced by the scrofulous diathesis, bone is secreted in abundance. Bony anchylosis in a scrofulous subject is very rare," &c. The head of the bone in scrofulous subjects is much softened.* In the museum of University College, however, we have several fine specimens of anchylosis, and also of bony deposit, after scrofulous disease of joints.

The matter of abscesses, formed in this disease, has frequently to take a long course to reach the surface; and hence sinuses of considerable extent are produced, leading to fistulous openings in the skin. Mr. Liston has a preparation, in which a sinus leads through the foramen ovale, and it was found to terminate in the rectum. Abscesses, produced within the joint, sometimes extend through the carious acetabulum into the cellular tissue of the pelvis. In one case, examined last winter in University College Hospital, this had happened; so that not only was the pelvis greatly occupied by pus, but some of the matter had descended into the upper part of the thigh, under the crural arch.

In the last stage, the acetabulum is sometimes filled up with a whitish organized substance, all distinction between synovial membrane, capsular ligament, cellular tissue, and this new substance, being lost: all being confounded together, and even the muscles altered in structure. In the acetabulum of the patient last referred to†, a fine specimen of a mass of organized fibrine was found: the preparation is now in the museum of University College. In some cases, the os innominatum is more extensively carious, than the head of the thigh-bone itself.

Sometimes, when the disease stops, anchylosis takes place between the femur and os innominatum, or the os ilium. In a few instances, a new joint is formed, and some degree of motion is allowed. In the museum of University College is the unique specimen of a new joint, formed by a globular or convex mass of new bone, thrown out at the side of the os ilium, and adapted to a cavity produced for its reception, at the inner side of the upper portion of the femur, all the head and neck of which are annihilated. The woman, from whom it was taken by one of my dressers, had a scrofulous abscess within the pelvis. This and various other facts led me not to join in the doctrine, that scrofulous disease of bone cannot be attended with deposit of new bone.

---

* See Coulson, op. cit. p. 27—39.

† See London Med. Gaz. loco cit.

The most essential part of the treatment consists in keeping the joint perfectly quiet: this principle is insisted on by all good practical surgeons. If the joint be moved, abscesses will form, and the disease take an unfavorable course. In the early stage, we may have recourse to cupping or leeches, poultices, and fomentations; and if the patient be a strong subject, or of the rheumatic constitution, we may, after having cleared out the bowels, prescribe two grains of calomel with half a grain of opium, which are to be taken every night, until the mouth is slightly affected. But if the medicines prove of no service, the vinum colchici may be exhibited in doses of ʒss. When the inflammation has been moderated, a blister may be applied, and kept open, or several blisters repeated in succession; and, as soon as the disease has become still more chronic, the joint may be rubbed with iodine liniments, the ung. potassii iodidi, ung. hydrarg. fort. with ʒj of the iodide of potassium to each ℥j of the ointment, or with camphorated liniment, strengthened with ℥ij of the tinct. canthar. to each ounce of it. With respect to an issue, seton, or the moxa, although these means are not so much confided in as they were formerly, I know from long experience, that when employed with judgment and discrimination, they often realise every expectation which can be reasonably entertained of the benefit capable of being derived from counter-irritation, and the maintenance of a discharge from the neighborhood of the affected joint. They are not, however, to be continued for an immoderate length of time, nor resorted to in very reduced states of the health, nor where abscesses have already formed, or fistulæ, from which a more or less profuse discharge is daily taking place. I have already insisted upon the great importance of keeping diseased joints in general strictly at rest. Here, as soon as the patient can bear mechanical contrivances for this purpose, we are to avail ourselves of them, and endeavor at the same time by their means to get the limb into as straight a position as can be done without occasioning pain. Mr. Scott's plan consists in cleansing the surface of the joint with a sponge, soft brown soap, and warm water, and then thoroughly drying it. The part is then rubbed with a sponge in the camphorated spirit of wine, and afterwards covered with cerate, made with equal parts of ceratum saponis and the ung. hydr. fort. c. camphora. This is thickly spread on large square pieces of lint, applied entirely round the joint, and supported with broad strips of the emplastrum plumbi. Over these strips is placed an additional covering of emplastrum saponis, spread on thick leather, and cut into four broad pieces, one for each side of the joint. Lastly, the whole is secured with a calico bandage, which is not to be applied so as to cause any uneasiness from pressure. If abscesses have formed, it does not appear that this method has the power of promoting the absorption of the pus; but, if fistulæ are present, the support of the above applications is alleged to prove beneficial.* The frequency of changing the dressings will depend upon the quantity of discharge. The principles of keeping the joint perfectly motionless, and the limb from inclining forwards, may be enforced by various mechanical contrivances, which consist either of leather splints, or cases of leather, or other materials, adapted correctly to the contour of the hip, nates, and thigh, and made to reach below the outer side of the knee, so as to maintain that joint also at rest.

In University College Hospital slips of patent lint, dipped in a solution of gum arabic, are sometimes employed by Mr. Liston, and laid upon the parts which are first greased. Several layers of dry lint are added, and the whole is confined with a bandage. When the composition dries, a firm case is formed, which may be made to embrace the parts from the knee up to the false ribs. I have tried this plan with advantage; but, when the patient can afford to purchase an apparatus, I recommend one made of leather, as best adapted to private practice. In scrofulous subjects, mercurial alternatives, with the extract of conium, chalybeate medicines, with the iodide of potassium, sarsaparilla, or for children rhubarb and carbonate of soda, with tonics, are the best medicines. The diet is to be light, but nutritious, with or without wine or beer, according to circumstances. If abscesses have formed and burst, and the appetite is bad, a little wine or porter will often prove of great service.

After the disease has been checked, the patient should be taken out in a spring carriage or boat, for the benefit of the air; and, if possible, he should try what good may be derived from the sea-air, and warm salt-water bath. In the advanced stage of bad cases, the constitution becomes completely hectic; and, before death, there is often general anasarca. Differences of opinion exist on the question, whether abscesses, proceeding from a diseased hip, should be opened early or not: Sir Astley Cooper prefers not making an opening, until the matter has extended to some distance from the joint, where, he believes, that it may then be made, without being followed by so much irritation as at an earlier period. This advice merits consideration, as the more common plan is to open all abscesses near joints without delay.

---

* See Coulson on Diseases of the Hip, p. 84. 4to. Lond. 1837.

After the disease of the hip seems cured, the patient should be very cautious; for I have attended some cases, where children, who had returned to school apparently well, on receiving a blow, or fall on the hip in play, were brought home again with a recurrence of the disease in an aggravated and fatal form.

Antiphlogistic measures, in the beginning, appears to be called for by Mr. Kay's view of the probable commencement of the disease with inflammation of the ligamentum teres. Afterwards, when the inflammatory symptoms have been subdued, nothing is more beneficial, than the application of some mechanical contrivance for the purpose of preventing all motion of the hip-joint, and keeping the thigh from inclining forwards, which last object is often very difficult of execution, on account of the pain which the attempt is apt to produce. Generally, the aim can be accomplished only in a gentle and gradual manner. One of the best contrivances for hindering all motion of the hip is, as I have stated, a leather apparatus, lined with soft materials, provided with straps and buckles, accurately fitted to the nates and thigh. It should also be made long enough to keep the knee-joint in a perfectly quiet state. Together with this, or some other mechanical contrivance, for the foregoing purposes, counter-irritation may be tried, either by means of a blister, an issue, the antimonial ointment, or a seton. In the course of the disease, it sometimes happens that portions of dead bone exfoliate; but more frequently nothing of this kind takes place. A good situation for issues is just behind and below the trochanter major: here they are less inconvenient to the patient than elsewhere; the peas can be kept in well; and the discharge and counter-irritation, whether kept up by peas, or the occasional use of antimonial ointment or caustic, will have the best effect. The skin, immediately in front of the joint, has sometimes been selected for the situation of issues or setons; but the other is preferred by the generality of practitioners.

ANCHYLOSIS

Is of two kinds, *complete* and *incomplete;* or, as it is sometimes expressed, *true* and *false.*

Complete or true anchylosis is that, in which the articular surfaces of the bones become firmly and inseparably connected together by osseous matter. When the cartilages of a joint are destroyed by ulceration, and the surfaces of the bones are carious, if we succeed in stopping the disease, the mobility of the joint will not generally be preserved, nor will the cartilages be reproduced; but the heads of the bones will be united together by osseous matter. True anchylosis, then, is, under such circumstances, scarcely to be regarded as a disease, but rather as the mode in which another disease terminates. The functions of the joint are permanently interrupted by it; but its completion denotes the cessation of all further morbid action. In coxalgia, if the cartilages and ligaments be destroyed in diseased joints, generally if attended with ulceration of cartilages and carious bones, and in scrofulous caries of the spine in particular, anchylosis is one of the most favorable terminations which can be hoped for. Now and then, however, coxalgia ends in the formation of a new joint, as already explained; and, occasionally, after the absorption of the cartilage, a substitute is obtained for it in the production of a substance, termed on account of its hardness and smoothness, the *ivory* or *porcellainous deposit.* In caries of the spine, the disease is never stopped till a complete and true anchylosis is established. This is the only mode of cure.

Whenever true anchylosis is expected to take place, or considered possible, the limb should be kept in that position which will afterwards be most useful.

True anchylosis* is a consequence, however, very much to be apprehended from fractures near or extending into joints, or from other mechanical injuries bringing on inflammation and suppuration of the joints. Here the right principles, with the view to its prevention are, in the first stage, to employ every thing calculated to lessen inflammation of the joint, as bleeding, leeches, calomel, cold evaporating lotions, and quietude of the part; and, in the second stage, after having thus kept down the inflammation a certain time to let passive motion be gently resorted to every day.

In all mechanical injuries of, or near, the large joints, these principles are never to be neglected.

In the records of surgery, examples are described, in which all the joints of the body were anchylosed; and in the Hist. de l'Acad. des Sciences for 1716, is the case of a child, twenty-three months old, which was afflicted with universal anchylosis.

Generally speaking, there is a natural tendency to anchylosis in the joints of persons far advanced in age, in whom the vertebræ and heads and tubercles of the ribs are frequently all joined by osseous matter.

False anchylosis denotes any loss of, or vast interruption of, the motion of a joint from any causes short of ossification, or the connexion of the articular surfaces by firm bony deposit. Thus the swelling and thickening of the synovial membrane, and of other soft parts, after bruises, fractures, and sprains, and weakness and loss of tone in the muscles, may produce a degree of stiffness about a joint, amounting to what is termed an *incomplete* or *false anchylosis.* Here gentle passive motion, friction, champooning, the exposure of the joint to the vapor of hot water, the aspersion of the part with warm or cold water thrown upon it from a height, the use of stimulating or iodine liniments, and the support of a bandage, are the best means of relief.

Though anchylosis of the lower jaw is of rare occurrence, instances of it have been met with; one is mentioned by Eustachius, and another came under the notice of Cruveilhier. He has given an engraving of the skull; the anchylosis was in the right articulation of the lower jaw. The subject of it, an old woman, was not more than eight or nine years of age when the anchylosis formed, which happened from a blow on the side of the face. The section of the joint which is exhibited, shows that there was not merely a deposit of bony matter external to the joint, but that the condyle of the jaw and glenoid cavity of the temporal bone were actually consolidated into one solid mass. Notwithstanding the anchylosis, the patient contrived to masticate with tolerable facility, by pressing the food against the alveolary process with her tongue. As for her speech, it was perfect; so that she managed to live to the age of eighty-nine with a great deal of comfort.

[Mr. Cooper does not speak of any mode of treatment for complete anchylosis. To American Surgery belongs the credit of having first devised and executed a plan for its cure. Dr. J. Rhea Barton of Philadelphia, in Nov. 1826, operated upon a young man, whose thigh was anchylosed at a right angle with the pelvis.

He divided the femur through the upper part of the great trochanter, and part of the neck of the bone, brought down the limb, and maintained it in its proper situation by Desault's splint, bony union being prevented by daily passive motion. At the end of four months, a false joint was formed, and the patient was able to walk without any apparent lameness. The patient enjoyed the use of his new joint for six years, when in consequence of some injuries, it became permanently anchylosed. (See N. Am. Med. and Surg. Journal, April, 1826.)

Dr. J. Kearney Rodgers, of New York, in 1830, operated for complete anchylosis at the hip-joint, at the N. Y. Hospital, in the same manner as Dr. Barton, and with the same success, for the time being; and though the limb ultimately became again anchylosed, the operation resulted in manifest improvement to the patient.

Dr. Barton also operated for anchylosis of the knee-joint, in which the leg was fixed at a right angle with the thigh. He sawed out a wedge of bone from the anterior surface of the lower part of the femus, and brought the sawed surfaces into contact, " thus bringing the limb into a position occasioning very little deformity and inconvenience, and adapting it to all the purposes of locomotion." The object of the operation being merely to straighten the limb, and render it of use, the success was complete.

Prof. Gibson of Philadelphia, in 1841, repeated Dr. Barton's operation, and with the same success. (See Am. Journal, July, 1842.)

In February, 1844, I assisted Dr. David Green, of this city, in an operation for complete anchylosis at the elbow. The patient was thirteen years old. When an infant, she had had confluent small-pox, which eventuated in an anchylosis of both elbows with the fore-arms extended. Dr. G. proposed to obviate this very inconvenient position, by forming a new joint just above the original one. He cut down upon the bone, divided it with a saw, and then placed the fore-arm at a right angle with the arm. The new point of motion was maintained for a few months, but gradually diminished, and the limb became again anchylosed, but with the fore-arm at a right angle with the arm, so that the operation was of great service to the patient, as it enabled her to bring her hand to her mouth and head.

In the treatment of complete anchylosis, when it is desirable to establish a false joint, I am confident, from my own observation, that it is necessary to do something more than merely divide the bone, and then depend upon passive motion. The action of the muscles approximates the divided surfaces so firmly and closely, that ossification will be almost certain to ensue, and foil the purpose of the operation. In order to succeed, from one to two inches of bone should be exsected; then the tension of the muscles would be obviated, and free motion could easily be established, and with it the false joint.—Ed.]

◆

INJURIES AND DISEASES OF TENDONS AND BURSÆ MUCOSÆ.

Some notice of these subjects will appropriately follow the account, that has now been given of the diseases of joints.

We know little about the pathological changes in tendons; but, it would appear from Mr. Key's investigations, that the reticular tissue, interposed between the tendinous fibres, is the medium by which the increased vascularity is produced in tendons which inflame and are about to ulcerate: or rather, I should say, a new vascular substance is developed, which becomes the organ by which the phenomena of ulceration are supposed to be chiefly effected.

The right principles in the treatment of divided tendons are well illustrated in the instance of *ruptured tendo Achillis*, an accident which takes place every now and then, in dancing, leaping, and other exercises, in which the muscles of the calf are put into violent action. It occurs chiefly in the male sex—seldom in females; and even when it happens in men, they are generally athletic and muscular subjects. At the moment of the tendon giving way, the patient feels a sensation as if he had been struck on the heel with the lash of a whip; and a noise is sometimes heard both by himself and the bystanders, as if a nut had been cracked under the heel of his shoe, or like the smack of a whip. If the part be now examined, a depression will be found in the situation where the tendon has given way, and the power of extending the foot will be considerably diminished, but not entirely lost; for the long flexors of the toes, the peronœi and the tibialis posticus, yet enable the patient to extend his foot in a weak and imperfect degree. In the treatment, the first and most essential principle is to relax the mass of muscles forming the calf of the leg, and attached to the tendon. The gastrocnemius and soleus are relaxed by bending the leg upon the thigh, and extending the foot: this is the proper position; but it cannot be maintained without the aid of bandages or some kind of machinery. The apparatus invented by Monro, primus, whose tendo Achillis was inadvertently ruptured, consists of a slipper, to the heel of which is affixed a strap, which is buckled to another strap put round the limb a little below the knee, and the heel is kept drawn up towards the ham. This contrivance, which has the recommendation of great simplicity, completely answers, so far as the foot is concerned; but it is a thousand to one against our being provided with or able to procure, such an apparatus when we are called in to a case of ruptured tendo Achillis; therefore we ought to be prepared to do what may be requisite, without any ready-made mechanical contrivance. Under such circumstances, after bending the knee and extending the foot, we may apply a longitudinal compress on each side the tendon, and then surround the ankle and tendon with a roller, applied in the form of the figure 8; next put a few turns of another roller below the knee, and let this bandage and that on the heel be connected together with a band placed along the back of the leg, by means of which band the foot is kept duly extended. In this manner, we shall experience no difficulty in keeping up the heel, and we need not use any particular contrivance for keeping the leg bent. If the patient be in bed, as he ought always to be for a few days at first, we direct him to keep the leg in the state of flexion; and when he gets up, we desire him to provide himself with a high-heeled shoe. The tendo Achillis generally unites firmly in from four to six weeks. Instances are on record (and Mr. Hunter's own case was one), in which the cure was affected without confinement at all, merely by keeping the foot extended, and letting the patient wear a high-heeled shoe.

With respect to *ganglions*, they are tumors connected with tendinous structures; and having very much the appearance of encysted swellings. They are filled with a fluid resembling white of egg, or calf's-foot jelly, their cysts being fibrous, and lined by a smooth membrane. On pressure, a ganglion feels remarkably hard, and destitute of elasticity. The tumor is generally fixed either to a tendon or to the fibrous sheath, or theca of a tendon; but sometimes what are called ganglions are actually collections of a glairy fluid within the fibrous sheaths themselves. Common ganglions are round, or globular; but sometimes oblong, which is chiefly exemplified when the collection of fluid is within the sheath. Some of these swellings about the wrist are so oblong, that a part of them may be felt on the palmar side of the annular ligament, and the rest higher up the limb on the wrist. Such ganglions form within the loose synovial membranes of the tendons. Ganglions are not usually attended with pain: they form slowly; and, in most cases, the only inconvenience experienced is a slight weakness of the muscles, or joint, whose action is interfered with. The patient may have a slight weakness of the fingers, or of the wrist; but, although most ganglions form on the hand, or wrist, others occasionally present themselves on the instep. I have seen several examples of ganglions on the foot; and I lately had a patient in the hospital who had one upon the inner head of the gastrocnemius. Certain subjects appear to be very liable to them, especially after bruises or sprains; but, in common instances, no such causes can be assigned for their formation. I attended a girl, who had three of them, two of which formed during the treatment of the first. It is a disputed point, whether any ganglions are truly parts of new formation, that is, whether they are actually new productions or growths. I believe many of them are only collections of fluid in the fibrous sheaths of tendons, which are natural and original parts; but whether others of a more globular, prominent, circumscribed figure, are of the same character, merely enlargements of original parts, is undetermined. Mr. Key looks upon them as new structures, formed upon tendons, and capable of being produced by pressure, friction, or undue exercise of a part.* Instances occur, in which ganglions at the wrist are attended with pulsation, and the occasion of severe pain. In the Dictionary of Surgery, ed. 7., I have referred to one case of this kind, the particulars of which are detailed in the Edinburgh Medical and Surgical Journal. The wife of a prisoner in the Queen's Bench, who was under Mr. Callaway, consulted me for a pulsatory swelling at the wrist, which was found to be a ganglion, with the radial artery passing over it. On pressing even slightly on the tumor, violent pain in the arm was excited, followed by fainting. The reason of this will be quite intelligible from the following account of another case, communicated to me by Mr. Morton, of University College Hospital, who saw the above-mentioned woman with me:—

"January, 1838.—When dissecting the upper extremity of an old woman, we found a small elastic swelling under the skin, a little above the wrist, upon the front of the forearm, near to its radial border. The cyst was of the size of a common hazel nut. Upon its surface several of the filaments from the radial nerve were expanded, so as to form a mesh upon the swelling. The sac lay over, and received the radial artery into its posterior surface. When it was opened a quantity of glairy fluid, of a light straw-color, escaped. The posterior, or deep-seated surface of the sac, was very irregular in its outline; but was not connected with the sheaths of the tendons.

---

* Guy's Hospital Reports, vol. i. p. 415.

"The only difference in the two cases, it appears to me, is, that in the woman, at the Queen's Bench, the radial artery lies upon the tumor, which has grown up from behind it; whereas in the instance above-mentioned, the vessel lay behind the sac."

Although ganglions usually produce little pain or inconvenience, patients are generally very desirous to get rid of them; and few persons behold with indifference any disfigurement, infirmity, or imperfection, about their hands or feet. Ganglions may occasionally be dispersed by blistering, or rubbing them with liniments containing ammonia, iodine, camphor, or the tincture of cantharides. Many of them will also yield to firm pressure, made on them with a piece of lead and a roller. But after being lessened, they often return, and on this account, instead of the plans which I have specified, it has been proposed to rupture them; that is, to employ such pressure as will burst them, and squeeze the fluid into the surrounding cellular tissue. When we can succeed in effecting this, either by striking the tumor with some obtuse body, such as the back of a book, or by compressing it against a bone with the thumbs, if it admits of it, the disease will generally be cured; for, after it is ruptured, if the pressure on it with lead or other compress be continued, the obliteration of the cavity, in which the fluid was collected, will be obliterated. Occasionally we cannot succeed in rupturing it at all, so strong is the texture of the fibrous cyst. Under these circumstances, we may puncture the cyst with a lancet or couching needle, introduced obliquely through the skin and the cyst, so as to let out the glairy fluid, or jelly-like substance, which it contains, after which steady and firm pressure is to be kept upon the part. I have treated many ganglions in this way with perfect success; and having seen no ill consequences from it, now commonly follow it. For the small tumors at the base of the palmar side of the fingers, Mr. Key deems the puncture the only remedy. This gentleman once punctured a ganglion, situated over the tendon of the trochlearis muscle, and the swelling did not return. In the writings of Mr. Abernethy, we find instances, in which tumors, supposed to have been ganglions, were converted by the irritation of setons into malignant and fatal diseases. Ganglions have been removed with the knife; but I think this practice would only be right when the swelling resisted all other means, was occasioning much greater annoyance than is commonly experienced, and had a shape and conformation that adapted it to such treatment.

Bursæ mucosæ are parts very liable to disease. They are membranous sacs, placed under tendons; or parts of the skin exposed to much pressure; and their use is to secrete a synovial fluid, which renders the surfaces, on which the tendons or integuments move, smooth and well qualified to facilitate the action of the muscles, and obviate the effects of friction. Sometimes, in consequence of sprains, bruises, pressure, or accidental inflammation, the cavity of a bursa becomes distended with a greater quantity of secretion than usual; it is therefore enlarged; and, in this state, a considerable degree of pain is experienced in the part; though, in many instances, the inflammation is of a more chronic character. This disease is often seen in the bursa, situated between the patella and the skin; but sometimes it takes place in the flexor tendons of the fingers, in that which is placed over the olecranon, or in that of the ball of the great toe. A curious case is related by Sir Benjamin Brodie, in which the bursa, situated between the latissimus dorsi and the lower angle of the scapula, was enlarged to the size of a man's head, in consequence of the disease now under consideration. The sacs of bursæ mucosæ, when inflamed, become considerably thickened; the fluid within them is sometimes clear, but, in other instances, turbid or even purulent; and occasionally it contains numerous granular bodies, which are compared to melon-seeds, both in respect to size and shape. Substances of this kind, however, are met with only when the disease has been of long standing. These swellings are very common on the patella, particularly in housemaids, who are employed a good deal in scouring rooms, in which occupation the pressure of the bursa against the floor has the effect of bringing on inflammation: hence the disease is sometimes called the *housemaid's knee.*

Treatment.—In the first stage of the disease, while acute inflammation prevails, and there is great tenderness, antiphlogistic measures should be employed, especially leeches, or even bleeding, cold applications, quietude of the limb, and brisk aperient medicines. Afterwards, when the disease has become more chronic, we may try discutient lotions, particularly those which contain the muriate of ammonia, vinegar, and a proportion of alcohol; and in a still later stage, blisters, or liniments containing iodine, or the camphorated mercurial ointment. Sometimes the disease cannot be dispersed by the above plans, and this is especially the case when the tumor contains those small granular bodies, like melon-seeds, to which I have adverted. There is always considerable difficulty in getting rid of them when they are of long standing, and the parietes of the bursa are much thickened; under these circumstances it is necessary to open the bursa, for the purpose of discharging the granular substances, and afterwards to excite such an inflammation in the cavity of the bursa as shall lead to its suppuration, granulation, and obliteration. If these processes can thus be brought on, without exciting too much inflammation in the surrounding textures, the disease will soon have a favorable conclusion. But, sometimes, though we open the bursa and discharge its contents, the necessary degree of inflammation does not ensue; the bursa continuing to discharge a glairy fluid, and the integuments to be from time to time cked with troublesome and painful degrees of inflammation, sometimes of the erysipelatous kind. I had a case, in which I opened the bursa over the patella; but the disease continued to annoy the patient for a considerable time after the operation, so that I found it necessary to inject a solution of the nitrate of silver into the sac, in order to excite the requisite inflammation for its obliteration: this measure succeeded, and the patient soon got well. Some surgeons recommend the introduction of a tent or seton for this purpose. I should mention, that we ought not to open bursæ mucosæ without a real necessity for it; for we occasionally hear of cases in which patients lose their lives in consequence of the limb being attacked with phlegmonous erysipelas. There are examples in which it is even necessary to cut away a diseased bursa, it being converted into such an indurated mass that no common plans will cure it; and its size seriously interfering with the action of the joint. In University College Hospital (this summer, 1839) I cut away one from the front of a woman's knee, which was as large as an orange, and every where solid, excepting a small central point, at which there were a few cells filled with a synovial fluid. The preparation is in the museum of University College. The tumor was so intimately attached behind to the ligamentum patellæ, that some care was necessary to avoid wounding the joint. In some of these cases, Mr. Key finds a seton capable of dispersing the swelling.

There is a common and very painful swelling, familiarly called a *bunnion*, situated on the ball of the great toe, and ordinarily supposed to arise from a thickening of the bursa placed at the junction of the first phalanx of the great toe with the metatarsal bone; though from the statements of Mr. Key, which will be presently noticed, this does not appear to be in every instance the nature of the disease. The surrounding cellular tissue is much indurated, and, in some cases, the bones of the joint are involved; at all events, the disease is frequently conjoined with a distortion of the toe, which seem partially luxated. In consequence of the projection of the tumor, it is greatly exposed to irritation from the patient's shoe, and from this cause it becomes the seat of repeated attacks of inflammation; indeed, few complaints are more distressing than an inflamed bunnion. We rarely find persons whose tarsal arch is flattened, that have the great toe in a line with the foot; and thus the inner part of the joint forms an angular projection. It is the kind of deformity in the arch of the foot, and in the bearing of the great toe, that disposes to bunnion. For the prevention of this consequence, Mr. Key adopts the following contrivance:—"The offending toe is placed in a separate compartment of the stocking, like the finger of a glove: this again is enclosed in a separate part of the shoe, which is contrived by fixing a piece of firm cow-leather in the sole of the shoe, so as to form a separate apartment for the toe. By these means it is kept in a straight line with the foot, or parallel to its fellows; and the pressure against the inner side of the joint being removed, the joint acquires a sufficient degree of strength to enable it, in a few months, to dispense with the artificial support." Four or five years ago, Weedon of Hart Street made for a young lady, under my care in Bedford Place, an instrument, which fulfilled the above objects exceedingly well. The principles of treatment consist in the removal of pressure from the part, and, when inflammation is present, in keeping the foot perfectly quiet, with the limb in the horizontal posture, and in employing leeches, poultices, fomentations, and cathartic medicines. Warm applications generally answer better than cold ones; but if the former fail to afford ease the latter may be tried.

One common plan is to cover a painful bunion with soap-plaster, spread on thick soft leather. The application, by keeping the skin in a pliant state, and protecting the part in some measure from the pressure of the shoe, gives partial relief; but, as Mr. Key observes, the plan does not reach the root of the evil. With this view, the inclination of the great toe must be corrected by mechanical means, made on the principles already explained.

In the dissection of a bunnion, the first effect of the pressure made by the edge of the base of the phalanx, is found by Mr. Key to be that of irritating the lateral ligament: if inflammation follows, it becomes thickened and painful, forming the bunnion. If inflammation is not excited, a series of small cavities or cysts are formed, in a manner analogous to ganglia, between the layers of the ligament. As soon as one of these cavities is obliterated, by inflammation, another is formed; and thus by their successive formation, the effects of pressure are warded off. In some instances, the irritation extends as far as the bone, and a fungous growth takes place from the cartilage. So long as the cysts remain in the state here represented, but little inconvenience is experienced. The pressure of the shoe, however, is frequently followed by paroxysms of suffering, the part becoming the seat of inflammation, and unable to bear the slightest pressure, either from without or from the base of the phalanx, in progression; sometimes an abscess occurs on the most prominent point, and, as the matter is slow in discharging itself, the surgeon generally makes an opening. The proceeding is condemned by Mr. Key as likely to be followed by an extension of the inflammation into the joint and disease of the bone. He has known gangrene and death ensue from an inflamed and suppurating bunnion; and three or four instances of the same results have come under my own observation. I concur with Mr. Key, therefore, in the advice to let nature bring about the discharge of the abscess, after which the ulcer will often heal up, and the part lose its extreme sensibility.*

---

* See Mr. Aston Key's Obs. in Guy's Hospital Reports, vol. i.

TUMORS.

What is a tumor? This at first view, as Dr. Warren justly observes, seems an easy question to answer; but, on a little reflection, there is some difficulty in giving the reply. The most simple idea of a tumor is, that it is an unnatural enlargement in some part of the body. But, is this enlargement an increase of a natural part, or a new formation? John Hunter's definition represents a tumor to be "a circumscribed substance, produced by disease, and different in its nature and consistence from the surrounding parts."

I believe it to be most convenient to limit the surgical meaning of the word *tumor* to a swelling, that is strictly a *new production*, an *adventitious growth*, a *substance that did not constitute any portion of the original structure of the body.*

In proceeding through the subject of diseases of the bones, I described certain morbid formations which are comprised under the preceding definition, as, for instance, exostoses, and fibrous and medullary growths from the medullary membrane. In the account of cancer, fungus hæmatodes, and melanosis, I shall have also to notice tumors, which, at least in some of their forms, are regarded as new productions in the system, and not merely as changes of structure, or as augmentations in the bulk of original tissues, for they comprehend several of those formations which are denominated *herterologous*, and which a distinguished professor of morbid anatomy describes as consisting "in the presence of a solid or fluid substance, different from any of the solids or fluids which enter into the healthy composition of the body." Professor Carswell's definition will include, however, calculous and purulent deposits, which, though they are heterologous formations, it is advantageous not to arrange under the head of tumors. While some of the growths, which I regard as tumors, correspond to the foregoing definition in not being like any of the original tissues of the body, others bear more or less resemblance to some of its primitive structures. Tubercle, scirrhus, and melanosis, are examples of the first; adipous and cartilaginous swelling, of the second. In fact, as Andral says, with reference to such of these deposits as become organised, when once vessels are developed in the morbid product, or sanguineous currents are established in it, the amorphus mass begins to lose its homogeneous nature, and to assume some definite kind of texture. The anatomical elements may now take the arrangement of fibres, layers, coats, or of a net-work; and they may put on the appearance of any of the normal structures, excepting two—the muscular and nervous.

Our profession is under many obligations to the late Mr. Abernethy, for drawing its attention very particularly to the great difference between tumors of the above nature, and other swellings, which are merely alterations of natural structure, or sometimes only the consequence of the accumulation of blood, pus, or other fluid in parts, and which last cases in particular have no claim to be considered as tumors, under the principle of classification here suggested. This was, unquestionably, making a bold step out of all the confusion, in which this part of the pathology of surgery used formerly to be involved. Nobody can doubt that the distinction here laid down is a good one, and that all swellings of original parts, to which no new morbid tissue has been added, and which consist rather of alterations of natural structures, or of the accumulation of pus, blood, or other fluids in them, than of the growth of any adventitious substance, should not be confounded with tumors, in which the latter circumstance is exemplified. The swellings of arteries, termed *aneurisms*, the knotty enlargements of veins, called *varices*, and all tumors arising from accumulation of blood, pus, or serum, in natural cavities and tissues, as well as a multitude of other examples, in which the tumor or swelling does not strictly consist of a new formation, growing upon or amongst, or added to, the original parts and tissues of the body, should not be comprised in the classification.

If there were not some limitation assigned to the surgical meaning of the word *tumor*, every disease, whatever might be its nature, if accompanied by increased fulness, or enlargement of parts would be arranged under this head, whether an aneurism, a phlegmon, a boil, a carbuncle, an abscess, or a dropsy. In truth, such is the miscellany adopted in old works, and which should not be called an arrangement, but a chaos.

As, however, we find the new matter deposited not merely upon free surfaces, like those of serous or mucous membranes, or within the cells of the cellular tissue, but likewise in the molecular structure of organs, after the manner of nutrition, it is manifest, that, when original parts become enlarged in the latter way, the disease ought to rank as a tumor, according to the principle of an adventitious substance being added to their primitive tissues.

In practice, the discrimination of the different kinds of tumors from one another is frequently a difficult task. As an excellent surgeon observes, the difficulties arise from a number of causes; from the great variety of these diseases, which is such that the most experienced surgeon is often meeting with species that he has never before seen; from the resemblance, in external appearance, between tumors whose character is quite different; and from the want of an arrangement, which will enable him to view them in groups, instead of being compelled to consider them, as often happens, merely as individuals.*

---

* Surgical Obs. on Tumors, with Cases and Operations, by John C. Warren, M. D., Professor of Anatomy and Surgery in Harvard University, and Surgeon of the Massa-

Tumors, in general, have been divided into *sarcomatous* or *fleshy*, *osseous*, *osteosarcomatous*, and *encysted;* many of the latter being familiarly termed *wens*, and consisting generally of a more or less fluid or fatty substance in a globular cyst. By a *sarcomatous* tumor is meant one that is chiefly or entirely composed of a fatty, fibrous, medullary, fungous, or other substance of inferior hardness to bone, with, or without a cyst, which, when it exists, is merely condensed cellular tissue, not globular, like that of true encysted swelling, and of a different texture. The term *sarcomatous*, or *fleshy*, as applied to tumors generally having no resemblance to flesh, is objectionable; and perhaps its use will gradually cease, especially now that the subject is beginning to have important additional light thrown upon it by the meritorious labors of several pathologists of the present day.

An *encysted* tumor is composed of a regular cyst, or sac, filled with matters of very different kinds in different examples, which matters are commonly secreted by the cyst into its cavity. The contents are not always fluid, being sometimes of a pultaceous consistence, sometimes like horn or bone, in other instances, like adipous substance. Frequently the cysts are filled with a fluid resembling honey or white of egg; and occasionally they contain melanotic matter, and even hair, or teeth. We also frequently meet with cysts, which serve as lodgments for hydatids.

Some *sarcomatous tumors* are encompassed likewise by a kind of cyst, by a dense cellular tissue, which yields, and becomes thicker and thicker as the tumor increases in size, and appears to form a sort of barrier between the new morbid formation and the healthy parts, so as to protect the latter in some degree from the extension of the diseased action to them.

Some *sarcomatous tumors* have no such limit, but extend in the direction in which there is the least resistance, and soon transmit their morbid action amongst the surrounding parts. Others have no tendency to communicate any diseased action to the rest of the body; but only become dangerous or annoying by their bulk and pressure. Some tumors grow rapidly, and prove troublesome in a few weeks or months; others remain for years, without much change or inconvenience. Medullary tumors are often remarkable for the rapidity of their growth, particularly when they meet with little resistance from the neighboring textures. The texture of some tumors bears more or less resemblance to that of the neighboring parts; thus, fatty swellings frequently grow in situations where they are surrounded by the natural adipous tissue. Cartilaginous tumors are often produced within joints, where they become detached from the artic-

---

chusetts General Hospital. 8vo. Lond. 1838. This work, for the present of a copy of which I beg here to return my best thanks to Dr. Warren, is replete with valuable cases, and practical remarks.

ular cartilages, and a cause of pain and lameness; and tumors of a cellular structure internally, and covered by a mucous tissue, frequently grow from the surface of mucous membranes. But, we are not to consider the resemblance of the substance of a tumor to the nearest tissues as an invariable principle; for many swellings not only have a different structure and appearance from those of the adjacent parts, from whose vessels they derive their supply of blood, but from every other healthy natural tissue in the body; and, as I have mentioned, Hunter defined a tumor to consist of a substance different in its nature and consistence from the surrounding parts.

Mr. Abernethy not only proposed the restriction of the meaning of *tumor* to what is truly *a new* and *adventitious formation*, and not *simply a change* or *enlargement of an original tissue*, but he suggested the plan of naming every tumor according to its anatomical structure. Thus he first applied the term *medullary sarcoma* to what is also called *soft cancer*, *fungus hæmatodes*, or the *encephaloid tumor*. That, and some other names which he selected, may be appropriate enough, but fault may be found with others; and his nomenclature, however ingenious, has the defect of not being altogether consistent. Thus, as it was designed to be one founded upon the anatomical structure of tumors, the term *cancerous sarcoma* is not admissible. I should say, also, that as many kinds of tumors have vessels, the phrase *vascular sarcoma* is not well chosen to express only one species of the disease.

One fact, perfectly established, is, that some kinds of sarcoma are merely new formations, unconnected with any *malignant tendency*, or any thing particularly wrong in the constitution. Thus common adipous swellings only become troublesome by their size, weight, and pressure; but a scirrhus, a fungus hæmatodes, and, perhaps, a melanotic tumor, though this may be doubted, are malignant diseases. Certainly each and all of them, inclusive of melanosis, are associated with constitutional derangement or peculiarity, the precise nature of which may not indeed be known, but of the existence of which not a doubt can be entertained. The distinction between *innocent* and *malignant tumors*, important as it is with reference to practice, and especially with reference to the propriety of operations, and the mode of performing them, is yet a subject involved in the greatest obscurity. Tumors, which in their regular progress destroy life, by the changes produced in the affected part, such as ulceration, bleeding, and sloughing, or by causing similar productions in other parts of the body, more particularly in important internal organs, or by both together, are considered to be *malignant*; and the occurrence of serious local and general symptoms, the development of new growths in other parts, and such constitutional suffering as leads to the suspicion that organs of consequence are involved in the affection, are generally set down as decided proofs of malignant character, and as insuperable objections to an operation. Yet, much caution is required in giving an opinion on the malignancy of some tumors. The on *tuberculated sarcoma*, as it was called by Mr. Abernethy, is represented by him as a very malignant disease; yet, in one example of it, recorded by Mr. Lawrence, where the original tumor had a most threatening aspect, where several similar tumors presented themselves in other parts, and where the patient had been brought to the brink of the grave by constitutional disturbance, life was prolonged for many years by amputation.

Some of the new formations or deposits, constituting tumors, are organised and vascular; others are completely free from organisation, and are furnished with neither vessels nor nerves. They seem to be merely morbid products from the blood, only deposits produced in the manner of secretion, and frequently from a serous surface.

With respect to the origin of vascular tumors, we have little information that can be supported by demonstration, or even by arguments unexposed to disputation. It is a subject, that was lately considered by Mr. Lawrence, in a paper read to the Medical and Chirurgical Society, in which he inquires into the mode wherein tumors originate and increase, and adverts to the three explanations usually offered of the phenomena:—1. By the effusion of blood, and its coagulation, and the subsequent organisation of the coagulum. 2. By the effusion and organisation of coagulating lymph. 3. By chronic inflammation. Now, if these explanations were true, we should expect, with Mr. Lawrence, that tumors ought to pass through successive stages, and to present different appearances at different periods of their development. For instance, we ought to find them at first as masses of coagulated blood, or coagulating lymph, and then to observe various degrees of transition from those substances to the textures, which characterise the perfect growth. Observations, however, disclose nothing of this kind: tumors, in their earliest state and smallest size, have their peculiar structure as well marked as in their subsequent progress and full development. An adipous tumor, not exceeding the bulk of a pea, differs only in size from one as large as the head. Effusions of blood into the cellular texture, from external violence, are of daily occurrence; if they could become organised, and then form tumors, few persons would be without the productions, which would also be, from the first, as large as the extravasation. We see, however, that blood thus poured out, disappears by absorption, or irritates the surrounding parts, and causes suppuration, by which it is expelled.

The hypothesis of the formation of tumors by the effusion and organisation of blood, seems, indeed, to have little foundation; and, I think, we must agree with Mr. Lawrence, that no satisfactory proof exists of blood becoming organised, when effused in wounds, bruises, or serous cavities, or aneurismal sacs.

The preparations in the College of Surgeons, put up by John Hunter himself to prove the extension of the vessels into coagulated blood, are considered by many good judges as insufficient for that purpose; because coagulated blood, when effused, soon becomes surrounded by fibrine or coagulating lymph, into which vessels may shoot from those of the surface, out of which such fibrine has been effused. Thus, the coagulum and fibrine being blended together, the former may give a deceptive look of being itself vascular and organised.

The interstitial effusion of coagulating lymph in inflammation, is a thing noticed every day; the substance thus poured out is not formed into tumors, but is absorbed as the inflammation subsides, or its partial organisation causes the enlargement, or condensation, of the affected structure. Then none of the phenomena characteristic of inflammation commonly precede the formation of tumors, which arise insensibly, and often attain some size before the patient is aware of their existence. Besides, as is well observed by Mr. Lawrence, if the accounts given of the origin and growth of tumors were correct, the attempts to check their production by leeches, cold applications, and antiphlogistic treatment, would generally have more effect than we find to be the case. Such treatment has no influence over accidental productions, though sometimes employed with advantage in lessening swellings caused by changes of structure.

From all that is at present known respecting morbid growths in the animal body, it seems to me, that they generally commence at a point as it were, and that directly the nucleus of them has been produced, however small, they have a power of attaining afterwards a magnitude, only limited by their particular nature and character. The vessels, which first extended into their substance, or their cysts from the original vessels of the neighboring parts, continue to deposit or secrete additional matter, and, as the tumor enlarges, the vessels also enlarge, and shoot into it wherever an increased quantity of organised substance is about to form. How this process begins, however, and from what cause it originates, we do not know.

The best pathologists are then in a state of ignorance, respecting the circumstances which determine the production of tumors in general, or of any particular variety of them. No more is known about these aberrations of nutrition, than of the mode in which this function is accomplished in its natural or normal state. In order to arrive at as correct a diagnosis as practicable, we should follow Dr. Warren's advice, and begin with acquiring the history of the origin and progress of a tumor, its influence on the part where it is situated, and on the whole system. Then the *figure* of the tumor should be well considered. Certain species of tumor assume particular forms: the steatoma, for example, is commonly rounded, and encysted tumors always have this form. Bony tumors, and those of the complicated glands, are often irregular; and so is a medullary tumor, after it has attained a certain size. The *connexions* of a tumour—its *extent*—its *movable* or *fixed character*, are all important points to be attended to; and Dr. Warren observes, the extent of the part, beyond the reach of the senses of touch and vision, may implicate the most important structures and cause the greatest embarrassment. The *consistence* is another source of information; for it often apprises us of a tumor being malignant, either a schirrus, or a medullary disease, or some other kind. The *color* in certain tumors conveys also information. The purple color of tumors, composed of a substance compared to erectile tissue, is universally known. The darkish red color assumed by medullary tumors, or fungus hæmatodes, in an advanced stage, is well known to every surgeon: and so is the brownish red discoloration of the integuments often covering scirrhus tumor. Sometimes, however, a tumor quite free from malignancy, presents a red or purplish appearance from an accidental inflammation of the skin that covers it.

Pulsation, *vibration*, and *undulation* are other characters, affording valuable instruction.* The first two indicate that the tumor is either affected by the pulsation of a contiguous artery, or that it is an aneurism, or else a tumor consisting of vascular erectile tissue, or of the nature of certain swellings spoken of in the remarks on "Diseases of Bones." *Undulation* informs us, of course, that the tumor contains at all events a quantity of fluid, though the rest of it may be more or less solid.

Adipous sarcoma, or the *fatty* tumor, is the most common of all these new formations. In its appearance and structure, it has a near resemblance to the subcutaneous fat, but is of a somewhat deeper yellow color, less granular, and more compact. It is always covered by a thin capsule, formed by the simple condensation of the surrounding cellular tissue, and having a close attachment to the mass itself, by means of small vessels, though, unless the swelling has been inflamed, the connexion to external parts is but slight. It is in consequence of these circumstances, that adipous tumors admit of removal with considerable facility, and, after a sufficient division of the skin, and other textures covering them, the diseased mass may be readily detached from the surrounding parts, sometimes with the fingers, and always without any troublesome dissection.

We frequently observe these fatty growths in persons, in whose constitutions no particular defect can be discovered; and sometimes they occur, not merely in one situation, but in several, though the individual may be in other respects perfectly healthy. They are generally attended with little or no uneasiness, and are characterised by a soft doughy feel, or one as if they were filled with wool. They have less disposition than many other tumors to become dangerous by changing into any malignant form of disease; and whatever pain and inconvenience they may produce, are the result of their weight, pressure, and magnitude; for adipous sarcoma is generally inclined to grow to a larger size, than any other solid kind of tumor met with in the human body. I have seen one or two examples, which weighed nearly fifty pounds, and larger ones are upon record. In some persons, they are caused by pressure. I have removed several from the upper part of the deltoid muscle in females, occasioned by the pressure of their dress; a case also noticed by Professor Warren.

---

* See Warren on Tumors, p. 9.

They are sometimes the seat of uneasy sensations, and they occasionally interfere more or less with the free action of the neighboring muscles; but, they are rarely the nidus of any scirrhous or medullary deposit; one or two such occurrences are alluded to by Sir Benjamin Brodie: they are exceedingly uncommon.

Now, when it is recollected, that the operation for the removal of an adipous swelling of immense size may prove fatal from the unavoidable extent of the wound; when we also remember, that we have no means of dispersing a fatty swelling, which, if left to itself, is sure to acquire considerable magnitude; and that when of immoderate size it is apt to become closely adherent to fasciæ, and even to the capsular ligaments of important joints, so as to render its complete removal difficult,—we must see the prudence of always taking away an adipous sarcoma, while it is small and but loosely attached to the surrounding parts. An adipous swelling does not, like a malignant tumor, require the free removal of the adjacent textures.

Pancreatic sarcoma, so named by Mr. Abernethy, from a degree of resemblance in its structure to that of the pencreas, is rather an uncommon disease, and scarcely any unequivocal specimen of it has been preserved in the museums of the metropolis. One was exhibited a few winters ago to the Medical and Chirurgical Society, as a rarity and even that was considered by some gentlemen present as having much the appearance of ordinary scirrhus. Mr. Abernethy represents pancreatic sarcoma as occurring sometimes near the nipple, and sometimes in the lymphatic glands on the mylo-hyoideus muscle, and as an irritable and excessively painful affection.

It has also been met with close to the parotid gland, or under the jaw close to the sub-maxillary gland. Pancreatic sarcoma is loosely connected with the surrounding parts, and therefore very moveable; a character in which it is said to differ from scirrhus, though we know that scirrhus, in its early stage, is frequently as moveable as any other kind of swelling. In some cases, recorded by Mr. Lawrence, the disease was free from pain and malignancy, and effectually cured by operation. The pancreatic sarcoma, which Professor Carswell arranges in his Illustrations of the Elementary Forms of Disease as a species of cancer, does not at all correspond to the disease noticed by Mr. Lawrence; and, as a foundation for classing the disease with cancer, he refers to its disposition to terminate in the gradual destruction or transformation of the tissues affected, its tendency to affect several organs in the same individual, and its reproductive character.

Another species of sarcoma, described by Mr. Abernethy, is the *mammary*, from the likeness of its structure to that of the mammary gland. It appears to be malignant, communicating to the surrounding parts a disposition to disease, and requiring the same free removal of them in an operation, as a scirrhus, of which I suspect that it is only a modification. In corroboration of this opinion, I may observe, that Professor Carswell, in his invaluable Illustrations of the Elementary Forms of Disease, actually arranges mammary sarcoma as a species of cancer.

The *tuberculated sarcoma*, consisting of numerous firm globular swellings of various sizes and colors, connected together by cellular tissue, advances to ulceration, is a malignant disease, and ultimately proves fatal. It is questionable, I think, whether this form of sarcoma is essentially different from scirrhus, which, we know, has its varieties.

A species of sarcoma, with which surgeons have long been familiar, is described under the name of *cellular tumor*, consisting of a fleshy mass, elastic, and almost fluctuating to the touch; tough, fibrous, and chiefly composed of condensed cellular tissue free from fat, the fluid in the cells being like that of the common cellular membrane.

Between the cellular tumor and the enormous swelling, in which the male organs of generation are sometimes involved, Mr. Lawrence conceives that there is this distinction,—the former is a new production, the latter merely an enlargement of the cellular and cutaneous tissues by interstitial deposit, and curable by extirpation.

The *fibro-cartilaginous tumor* is another variety of sarcoma, not unfrequently met with about the head, neck, and axilla; and sometimes near the mammary or parotid gland. It differs from scirrhus in having nothing malignant in its nature; the only inconvenience is what results from its pressure and size.

I removed a fibro-cartilaginous swelling from the occiput of a blacksmith at Halliford, which had been stationary and free from pain for many years, but at length began to enlarge and cause severe annoyance. It was as large as an orange; and the patient was induced to have it removed, in consequence of his suspicion that a difficulty of swallowing, which he labored under, was dependent upon it. The latter affection ultimately proved fatal, and, on opening him, a stricture of the œsophagus was found, with two considerable sacs extending from the tube above the obstruction, in one of which where two orange pips.

The *painful subcutaneous tumor or tubercle*, although of small size, and free from malignant action is attended with most excruciating pain, and generally situated in the subcutaneous cellular tissue, but sometimes in that which is between muscles. One tumor of this kind, removed by Mr. Liston, lay so deeply, that it was in contact with the posterior tibial nerve. The tumor is usually of the size of a pea, and seldom larger than a cherry. Ordinarily, it does not cause any external tumor, or any rising of the skin, unless situated on a superficial bone; the skin is loose and moveable over it, and its structure is almost like cartilage. The reason of its causing the extraordinary degree of pain by which it is characterised, has been ascribed by some pathologists, amongst whom is the celebrated Camper, to its connexion with the twigs of the subcutaneous nerves. One preparation in Mr. Liston's collection clearly exhibits such an arrangement, which, however, is contrary to what Sir Astley Cooper and Baron Dupuytren have noticed in their dissections.

Camper's opinion that the tumor depends upon a diseased enlargement of a portion of a subcutaneous nerve, is that to which Mr. Wood himself inclines though he thinks it very desirable that additional minute and accurate examinations of the tubercles and surrounding parts should be made, with the view of ascertaining, if possible, whether the diseased alteration of structure takes place on the neurilema or within it, or whether it may have originated in the contiguous textures, and become afterwards connected with the nerve. In those painful tubercles which he had an opportunity of examining, he found only a firm, whitish, homogeneous body, of a fibro-cartilaginous appearance, without being able to say whether it was included between the nervous fibrils or not, or whether it was even positively connected with them.

The pain comes on periodically, and shoots extensively through the limb. The slightest pressure causes the most excruciating torment; and such is the agony sometimes excited by the action of the muscles, that the use of the limb is entirely lost. The disease is more common in the limbs, particularly the lower ones, than other parts. I have never seen an instance, in which a painful subcutaneous tubercle suppurated; but, according to Dr. Warren, it may, after a time, inflame, the skin over it ulcerate, and a foul acrid discharge take place. Then, the lymphatic glands, between it and the trunk become swollen, constitutional disturbance ensues, and the disease may prove fatal.* There is only one right and effectual treatrment, namely, excision.

Nævi, and tumors termed aneurisms by anastomosis. Certain natural textures in the body are, in the ordinary state, flaccid, but admit of being rendered turgid and firm at particular periods, when injected with blood. This kind of structure is exemplified in the penis, clitoris, and nipple; and by anastomosis it is termed the *erectile tissue.* Baron Dupuytren compares [the tumors, which usually go under the name of *nævi* to a *morbid erectile tissue;* and, so far as I can judge, there is a sufficient resemblance between the natural tissues of this kind, and the structure of nævi, to justify the comparison.

---

* See Warren on Tumors, p. 60.

Under the head of morbid erectile tissues may be arranged,

1. The surperficial nævus.
2. The subcutaneous nævus, and aneurism by anastomosis.

Superficial nævi, or *nævi materni*, as they are called, signifying those congenital tumors, spots, or imperfections and peculiarities in the appearance and texture of parts of the skin, which are vulgarly supposed to arise from some influence of the mother's mind upon the fœtus, as when during her pregnancy she *longs* for various delicacies and fruits, which she is not able to procure, or, at all events, which she cannot obtain so quickly as she desires; or when, perhaps, during her pregnancy, she is terriby frightened at the sight of a spider, mouse, or some other animal. Under these circumstances, whatever cutaneous mark the infant is born with, is imputed to such disaster. As a proof of the truth of the connexion of nævi with such longings or frights, a strong resemblence is often fancied between these maternal spots and the objects of desire or alarm. Thus some nævi with a granular surface are compared to strawberries, mulberries, or raspberries, and are supposed to become particularly red and conspicuous when those fruits are in season. Others have a reticulated appearance, produced by the ramifications of minute vessels on their surface, and being thought to resemble a cobweb, are named *spider's nævi;* then other congenital blemishes of the skin, on account of their peculiar red color, are called *claret marks.* Another form of nævus is familiarly known, receiving the name of a *mole*, in consequence of its brown color, and the long hairs growing upon it. Objects of this kind always present an opportunity for a flight of the imagination, and for the invention of comparisons and names.

These superficial nævi frequently continue stationary during life, and neither increase in size, nor cause any inconvenience; but sometimes, in consequence of their happening to be situated on the face or neck, they cause considerable disfigurement, and, with the view of removing or lessening it, the excision or removal of the blemish with caustic, or vaccine lymph, may be undertaken, if desired.

Examples do occur, however, in which these maternal spots assume after birth, a disposition to grow, and even to acquire considerable size. In this circumstance it is prudent to recommend their extirpation with the knife, the nitrate of silver, ligature, or caustic potash, according to circumstances. Very superficial ones are easily cured with nitrate of silver and pressure; or by inserting vaccine lymph in them, or touching them with nitric acid or a strong solution of nitrate of silver, or rubbing them with this substance.

Of subcutaneous nævi, and aneurism by anastomosis. With respect to these tumors, probably they differ from the more superficial kinds of cutaneous nævi in being new formations, and not merely changes of structure. Between aneurisms by anastomosis and subcutaneous nævi, I can discern no essential difference. Their nature and texture are alike; and, though the subcutaneous nævus communicates no pulsatory feel, while the aneurism by anastomosis does, this is to be referred to the latter often forming an external tumor; a projection above the level of the skin—while the subcutaneous nævus is more flat and concealed. As for the proposed distinction, between aneurism by anastomosis and nævus, founded upon the supposition, that the former disease consists of an enlargement and growth of the small arteries, and the latter of similar changes in the venous capillaries, it must be abandoned; first, because there is no proof of the alleged circumstances, and secondly, because the blood, which gushes so profusely from nævi, when they are wounded, is of a bright scarlet color, and manifestly arterial. The aneurism by anastomosis, which is more or less raised above the level of the skin, is in fact a morbid growth—a new production. Its color is generally bluish, or livid, and, on careful examination, a pulsatory motion, corresponding to the action of the heart, or, at all events, a vibration, may be felt in it. Sometimes, the skin retains it natural color. I once made an exploratory puncture in a tumor of this kind on a child's back at Sunbury, the integuments being quite free from discoloration, and no vibratory feel being perceptible until the child felt the pain of the incision: the rapid bleeding immediately apprised me of the nature of the disease, and I immediately closed the wound, which healed by the first intention. When compressed, it becomes smaller; but any thing, that quickens the circulation, always makes it more prominent and turgid. Frequently it is a congenital disease, being small and hardly perceptible at the time of birth, and remaining stationary until puberty, when it may begin to enlarge with rapidity. It has been known to follow external violence, and Professor Warren relates one case, where the disease followed a cut, which had been caused by the blow of a stone on the right side of the occipital region. After it has acquired a certain size, it sometimes bursts, and bleeds dangerously. In females, the discharge of blood is most disposed to happen at the menstrual periods, and even to supply the place of the uterine evacuation.

The parts of the body, in which the disease, improperly named *aneurism by anastomosis*, is most frequently seen, are the scalp, face, upper part of the trunk, and sometimes the hands and feet.

John Bell has described it as a tumor, consisting of a congeries of active vessels, and he states, that the cellular tissue, through which these vessels are distributed, resembles the cellular structure of the penis, the gills of a turkey-cock, or the substance of the placenta, spleen, or womb. In short, his comparison is nearly the same as that made by Dupuytren, namely, to the *erectile tissue*. The aneurism by anastomosis, and the larger subcutaneous nævi, are occasionally represented as containing cells, which are filled with blood, and have a direct communication with the blood-vessels. This is yet an unsettled point; for what appears to some persons to be cells, is thought by others to be the orifices of blood-vessels, who, of course, regard the disease as an aggregation of such vessels, ramifying and combining into a tumor. At all events, it is an adventitious growth,—a new formation—full of vessels—abounding in blood—and, when cut, exhibiting such a disposition to bleed profusely and ungovernably, as is perhaps not seen in an equal degree in any other disease that can be specified. The erectile tumor or structure, is sometimes blended with medullary or scirrhous cancer.

Whatever plan of treatment be selected for subcutaneous nævi and aneurism by anastomosis, should be regulated by the principle of not endangering life by hemorrhage.

Supposing therefore it is decided to perform the excision of a nævus, we ought to adhere to the rule laid down by Mr. John Bell, "not to cut into the tumor but to cut it out." If we were to cut into the disease, we should sometimes have so profuse a bleeding, that the patient would die under our hands. The blood might gush out in such a torrent, as would destroy a child in two or three minutes. Besides, as it is absolutely necessary to cut the whole of the diseased texture away, without leaving any part of it behind, we should gain no advantage by opening the swelling. The whole must be taken away, or what is left will continue to grow. Hence it is a rule in practice, to make the incisions for the removal of a nævus in the surrounding healthy parts, at some little distance from the circumference of the disease, and then to cut deeply under its base. But, when a nævus is large, excision, even performed with these precautions, is not free from danger, on the score of hemorrhage. Several cases are recorded, in which the operation led to so sudden and profuse a gush of blood, that life was extinct in a few minutes. Such an accident happened in Mr. Wardrop's practice, who with his usual candor has recorded the fact himself. The patient was a child, and the nævus large. On examination, a vessel equal in diameter to a quill, was found to have been divided. Indeed we may form some conception of the disposition to hemorrhage attending this disease, when I state, that I have seen Mr. Lawrence, with the view of curing a growing nævus on one of the fingers, divided every part of the finger, except the periosteum and bone, and yet the vessels on the distal side of the cut bled most profusely; and this notwithstanding the radial and ulnar arteries had both been previously tied by my friend Mr. Hodgson.

Instead of the knife, therefore, other means of curing nævi have been suggested. One of these consists in passing two double ligatures through the centre of the base of the swelling, at right angles with one another, and tying the part by quarters, as it were, so as to include the whole base in the eight threads. For the purpose of making the action of the ligatures extend more widely, so as to embrace tumors having a broad base, long pins are sometimes passed under the swelling, and the ligatures then twisted round their ends, as originally practised, I believe, by my friend Mr. Keate. Sometimes, with the view of lessening the disfigurement, and rendering the action of the ligatures more effectual, Mr. Liston first raises the skin from the surface of the swelling, in order to preserve it, and then applies the long pins and ligatures.

Another plan consists in taking up the principal artery, or arteries leading to the disease. This plan sometimes answers; but more frequently it produces only partial, or temporary relief. The ligature of the carotid for aneurism by anastomosis situated in the orbit or other parts of the face and head, answered completely in the practice of Travers, Dalrymple, and Warren: in that of Dupuytren, it did not cure the disease, though it put a stop to its increase.

A fourth plan consists in destroying the tumor with caustic potassa. And a fifth is founded on the principle of producing a total change in the texture of the swelling by exciting inflammation in it with pressure, caustic, or stimulating applications, or by the introduction of a small quantity of the nitrate of silver, solution into the morbid tissue. Vaccination is useful for superficial nævi on the same principle. Breaking up their texture with a fine couching needle, or exciting the adhesive inflammation in it by transfixion with pins, has also been done with success. Professor Gibson mentions an example of spontaneous cure, brought on by an accidental inflammation consequent to fever.

[I am convinced that the hot needles succeed better than any other plan, which has been tried for the cure of the aneurism by anastomosis. I have had occasion to treat this form of aneurism frequently within the last few years, both at my clinique, and in my private practice, and have been highly gratified with the result. For needles, I prefer the small sized shoe-makers' awl, which is curved at the point. This is heated to a red, or what is better, a white heat, and then thrust through the tumor in different directions, some six or eight times. In this way inflammation is produced, which obliterates the caluses, and leaves a firm mass instead of a soft, spongy, erectile tumor.—Ed.]

Polypi constitute another class of tumors, growing from mucous membranes, or, if not growing from them, at all events covered by them. In this place it is only necessary to notice their general characters, and the principles of treatment. They are of two kinds, viz., the *soft gelatinous* polypus, and the *fleshy*, or *fibrous* polypus. As for what are termed *malignant* polypi, they should not be regarded as polypi at all, because they partake in reality of the nature of medullary cancer, and sometimes, perhaps, of scirrhous cancer.

The ordinary soft polypus, such as most frequently grows from the mucous membrane of the nose, is of a light yellowish, or grey color, not disposed to bleed profusely when injured, and not very sensible. It has no tendency to become malignant, and whatever inconvenience attends it, arises from its pressure and size. It generally has a narrow neck, and often a pyriform shape, though when the swelling is large, its figure is chiefly determined by that of the cavity in which it grows.

Fleshy polypi, which are firmer than the preceding, and of a fibrous structure, more commonly grow under the lining of or in the substance of the uterus, than from the mucous membrane of the nose.

The treatment of soft and fleshy polypi consists in extracting them with forceps, as is usually done for those of the nose; or by tying their neck with a ligature, or dividing it with scissors, as is more frequently practiced for those which grow from the uterus. Malignant polypi admit of no operation.

Warts are excressences growing from the cutis, and sometimes covered by the cuticle. They usually assume an expanded shape, or radiate from their basis to their surface, which in general has a granular appearance. After they have risen above the level of the skin, their base often remains stationary, but the higher part of them continues to expand, and to become rougher and rougher. Their substance is compact and firm, and sometimes very sensible, and disposed to bleed freely when cut. In this respect, however, warts are not always alike, some appearing to be unorganised, and insensible.

When much stimulated, they generally become smaller, and disappear or drop off. For this purpose, the most eligible applications are, nitrate of silver, acetic acid, tinct. ferri sesquichloridi, or a powder composed of subacetate of copper, and savine in equal parts. When the neck of the wart is narrow, the best practice is to divide it.

The thin integuments, situated near the anus, often produce excressences, which are of an intermediate nature between polypi and warts. They are of all sizes from that of a pea to that of an egg, or orange. In consistence and vascularity, they hold a middle space between warts and polypi. When small, they may be cured by local stimulants; when large, the most expeditious plan is to remove them with a knife.

Encysted tumors or wens, are composed of cysts, whose texture, thickness, and contents, are subject to a great deal of variety.

The cysts themselves are organised; but their contents unorganised. They are generally of a globular form, and unattended with pain. They are divided into three principal kinds, named according to the nature of the substance with which the cysts are filled. When it is fluid, and more or less like honey, the tumor receives the name of *meliceris;* when it is of a pappy or pultaceous consistence, the tumor is called *atheroma;* and when the contents are fatty, *steatoma.* Atheromatous swellings on the head and back of the trunk, usually have thick dense cysts; while the cysts of similar tumors on the face are generally thin. Sometimes the cysts are ossified. In ordinary cases, the cyst has only one cavity; but, occasionally, there are partitions in it, dividing its interior into separate cells of various sizes. The internal surface of the cyst is mostly smooth, presenting an appearance somewhat like that of fine cuticle. In some instances, the cyst is loosely connected to the surrounding parts; in others, it is firmly attached to them, and immoveable. Certain descriptions of encysted tumors attain a considerable, I may say an enormous, size; but common ones, known by the name of *wens*, are from the size of a pea to that of a walnut or orange. Those which contain fat, sometimes become as large as a cocoa nut; but the swellings, known under the appellation of *hydatid cysts*, and *ovarial cysts*, are frequently of enormous magnitude.

The terms *meliceris*, *atheroma*, and *steatoma*, as expressive of three kinds of encysted tumor, are then by no means sufficient to convey an idea of the nature of many encysted swellings. The cyst may secrete matters of very different consistence and appearance: thus, some are filled with a thin fetid brown fluid, mixed with flakes of the fibrinous part of the blood; some contain a serous fluid; some a matter of gelatinous consistence; some, a calcerous matter; some, a melanotic liquid; and others, hair, teeth, hydatids, or various depositions of more or less firm substances disposed in concentric layers.

The greater number of common encysted tumors are situated immediately under the skin; but there are few textures, parts, or situations, in which they may not be produced.

It appears from the investigations of Sir Astley Cooper, that, in the early stage of a common wen, a dark-colored spot may often be seen on the skin in the centre of the tumor, and such spot, he says, is caused by the obstruction of the orifice of one of the sebaceous glands of the skin. He therefore adopts the opinion, which is now universally admitted to be correct, that some encysted tumors are only enlargements of the cutaneous follicles, in consequence of such obstruction of their orifices. Of course, this explanation would not apply to many cysts in deep situations, and which are unquestionably parts deserving to be considered altogether as adventitious growths.

Children are sometimes born with encysted tumors. When formed near the eyebrow, they generally adhere to the bone, and are covered by the orbicularis palpebraum, or occipito-frontalis muscle.

In some persons a remarkable disposition to encysted swellings is observed, and this in such a degree, that more than twenty have been noticed in different parts of the body. One of the most remarkable instances of this kind was a woman, who presented herself, about four years ago, at University Hospital, with seventy or eighty encysted tumors on different parts of her body. As some of them obstructed the meatus auditorius, they rendered her deaf in one ear. The largest of them did not exceed a walnut in size, and most of them were not larger than peas. She had had forty or fifty extirpated before she came to the hospital, but they continued to grow in such numbers, that she would not submit to any further attempts to free her from them. I was informed that, at the menstrual periods, these tumors always become more prominent and turgid, and rather painful; a character more usually exemplified in nævi, than wens.

Perhaps the common species of encysted tumors are more frequently formed on the head than in any other situation, and, when they occur here in adult subjects, they are mostly of the atherometous kind. In children, atheroma is also very common on the face. Many encysted tumors about the eyelids are likewise atheromatous.

In encysted tumors of the steatomatous sort, hair is sometimes blended with the fatty matter, and it differs from the hair naturally growing on the surface of the body in having no canal nor bulb.

Some cysts not only have the power of forming hair, but of producing a horny substance. This sometimes happens when the swelling ulcerates, so as to let out its contents, and expose the interior of the cyst to the air. Then the cavity becomes dry, and a substance of a cuticular or horny quality, continuing to be secreted, gradually protrudes. One in the British Museum is remarkable for its resemblance to a ram's horn. A few years ago, I removed a horn of this nature from the nates of an elderly medical gentleman in my neighborhood. Occasionally cysts are met with containing teeth. One instance of this kind fell under the notice of Mr. Barnes of Exeter.

Those small cutateous encysted tumors, which have a black point on their centre, will sometimes allow the obstructed aperture to be cleared and their contents pressed out; and in this manner, they may be kept stationary and free from inconvenience for a long time.

Encysted tumors are seldom dispersed, though this event occasionally happened, in consequence of changes brought about in them by accidental blows, or by inflammation excited in their cysts. On this principle, they are sometimes, but not often, cured by the application of local stimulants, as a solution of common salt, or lotions, containing the muriate of ammonia.

The plan of puncturing common encysted tumors, squeezing out their contents, and applying stimulants or caustic to their cysts, not only frequently fails to produce a perfect cure, but is attended with some risk of giving rise to the formation of fungous growths, which are ten times worse than the orignal disease.

Sometimes encysted tumors occur in parts, from which they cannot be wholly removed, and then, if the cyst be thin, a puncture may lead to a cure. In this way, encysted tumors, placed deeply in the orbit, are sometimes cured. An encysted tumor will sometimes inflame, and the most superficial part of it having given way by ulceration or sloughing, the contents escape, and the cyst itself sloughs away, leaving an ulcer which heals, and a cure is the result. I have more than once been called to atheromatous swellings, the skin over which was inflamed, and perforated by a small ulcerated opening, within which the white sour-smelling pappy matter could be discerned. Instead of practising excision, I have sometimes merely pressed out the atheromatous substance, and applied a small poultice, after which the cyst has gradually been separated in fragments, and the cure accomplished. Not long ago, I attended a lady with Sir Astley Cooper, and the swelling being severely inflamed, an incision was made, and the contents of the tumor pressed out: the cyst afterwards followed, and the part healed in a few days.

There are two methods of removing common encysted tumors: one is to divide the skin and fat over the cyst, and having separated the latter from the surrounding textures, it is to be seized with a small hook, and dissected out entire. In some situations, the dissection may be completed without the hook, which, if the contents of the cyst be very fluid, lets them partially escape, so that cyst collapses, and is less easily taken out perfect. The other method is to cut the cyst at once into two halves, and then to extract each half of it separately, as practised by Sir Astley Cooper. No part of the cyst must be left behind. If not removed, the patient may continue to be annoyed with a discharge of matter from a fistulous opening, or a painful troublesome fungus may arise, requiring another more painful operation than the first to be cured.

Congenital cysts near the eyebrow adhere closely to the bone, and require a free incision, so that every portion of them may be taken out.

[Dr. Alex. H. Stevens, in a paper published in the N. Y. Journal of Medicine for January, 1840, has given us some capital practical hints on the removal of non-malignant tumors. This class of morbid growths are surrounded by a firm cyst, made up of the adjacent cellular tissue. This envelope is more or less thick, depending upon the size of the tumor. The vascularity between the cyst and the tumor is slight. The first step in the operation is to lay the sac freely open, and then, the tumor is as it were rolled out, either by the finger, or by the handle of the knife, and all hemorrhage will be avoided. The carcinomatous tumors have no cysts; the encephaloid and scrofulous have one, well defined in the earlier stages of their development, but

when inflammation has been set up, by the, or from the, progress of the disease, the cyst becomes so completely amalgamated with the once well defined tumor, that a separation between the cyst and tumor is impossible.—Ed.]

SCIRRHUS AND CANCER.

The specific and malignant disease, known by the name of *cancer*, may begin either as a molecular deposit in the tissue affected, from a derangement of its nutrition, or as a deposit of the cancerous substance upon what Professor Carswell terms a *free surface;* as, for instance, that of a serous membrane: here it is, then, in the form of a secreted matter. It generally has two stages, namely, *that of induration*, or *scirrhus*, as it is termed, the first shape in which the disease usually presents itself; and *that of ulceration*, which is a later condition of it.

The disease, in the stage of scirrhus, is sometimes denominated *occult cancer;* and, in the ulcerated stage, *open cancer*, or *carcinoma*. I think, that when the latter word is employed, the generality of surgeons now signify more particularly the ulcerated form of the disease. There is no uniform custom, however, about this point; and sometimes carcinoma is only synonymous with cancer.

In Professor Carswell's Elementary Forms of Disease, Fasciculi 2. and 3., the term *carcinoma* includes cancer and medullary sarcoma, as two species, under the names of scirrhoma and cephaloma, each of which presents varieties, determined chiefly by the relative quantity of the morbid deposit, the manner of its distribution, and the difference in its color and consistence.

Scirrhus, at its commencement, occupies a minute and limited space; thus it may be confined to one of the acini of the liver, as Professor Carswell has ascertained. In the breast, it is commonly of a globular form, and irregular and craggy, as it were, on its surface. It afterwards enlarges, though rarely in the degree or with the quickness exemplified in many tumors of a different nature; it also continues to be moveable for a certain time, but has a tendency to become fixed by attachments to the neighboring textures, at an earlier period, than what is observed with respect to most other swellings.

Scirrhus is likewise remarkable for its excessive firmness, its cartilaginous, or, as it is sometimes expressed, its stony hardness. The substance of it, however, is not one uniform, homogeneous mass, but it is intersected by *septa*, or bands, the interstices of which are filled with a yellow, grey, or light blue semi-transparent inorganic substance. These bands, or septa, often diverge, as they proceed from the centre of the disease, sometimes radiating, as pathologists are fond of expressing themselves, a considerable way into the surrounding textures, so as to extend the same morbid action to them. The septa, now described, have a tough consistence, and are very much like a ligamentous tissue.

When a section is made of a scirrhus, a central point, or nucleus, may be observed, from which these dense ligamentous bands proceed towards the circumference. Sometimes the larger bands subdivide into smaller ones, which follow a course similar to that of their trunk, and ramify very regularly, or the bands may pursue from the first an irregular and intricate course, often uniting with and crossing one another, so as truly to present, when minutely inspected, a retiform appearance.

Frequently the greyish or bluish matter, interposed between the firm tough septa, appears broken down or removed, its place being occupied by a glairy or a turbid fluid, by a very soft, pulpy, semiliquid substance, or blood itself.*

It was a remark first made by Laennec, that scirrhus and medullary sarcoma (lamatière cérébriform) as well as other adventitious productions, which have nothing analogous to them in the tissues of the animal body, present in their progress two different states; the first named by him the state of crudity; the second, that of softening. This view does not, however, appear to be correct; for, according to Dr. Carswell's researches, the degree of consistence of cancerous formations is not an invariable character of a particular stage of their development; for they may, when first perceivable, be as hard as cartilage, soft as brain, or fluid as cream; or they may become soft or fluid, or having remained for a greater or less time in a state of hardness.

Scirrhus cancer most commonly begins in glandular or secreting organs,—as the female breast, the skin, or mucous tissues, the tongue, the cardiac and pyloric portions of the stomach, the cervix uteri, the rectum, the lips, especially the lower one, and the glans penis. The testicle and ovaries are also liable to cancerous disease. The parts which I have specified, are some of the principal ones on which cancerous disease makes it *primary* attack; but many other textures and organs may become the seat of it secondarily; as, for instance, the lymphatic glands, the lungs, the liver, and even the bones. It is not to be supposed, however, that lymphatic glands are not sometimes the primary seat of cancer. In fact, sometimes the scirrhous cancer, and in other instances the fungoid or medullary cancer, commences in them.* Mr. R. W. Smith, in some interesting remarks, annexed to a case of this description, expresses his belief, that when carcinoma begins in the axillary glands, and the breast is only affected secondarily, the cases are more rapid in their progress, and more fatal in their termination, than those in which the disease of the lymphatic glands follows that of the breast. In persons, who have long suffered from carcinoma, portions of the natural structure of the bones are frequently absorbed, and a scirrhus substance is deposited in their place. This fact is sometimes exemplified in the ribs and sternum; and we have in the museum of University College the upper part of a cranium, taken from a person who died of cancer of the breast, and illustrating the secondary effects of the disease on the parietal bones. Probably, if the viscera of the same individual had been carefully examined, the cancerous texture might also have been traced in several of them. I attended a gentleman's coachman in Montagu Street, Russell Square, for carcinoma of the bladder, and the effects of this disease on the skeleton were such, that one of the ribs and the left thigh-bone underwent spontaneous fractures previously to the patient's death. The rib and the thigh-bone I have placed in the same museum. As secondary effects of cancer, scirrhous formations have been noticed in the walls of the heart itself. A case, illustrative of this fact, occurred in St. Bartholomew's hospital, and the particulars of it were inserted in the Medical Gazette, by Mr. W. M. Coates. In this example, the primary cancerous affection was situated in the lower lip; a form of the disease not unfrequently regarded as entirely local.

---

* The varicous state of the capillaries, alleged to be connected with the production of cancer, in some of its forms, is a subject which I do not enter into at present, because it yet awaits further elucidation.

When cancer is considered as a genus, comprehending in its species scirrhus, common vascular sarcoma, pancreatic, medullary, and mammary sarcoma, and fungus hæmatodes (the view adopted by Professor Carswell), many other parts may be set down as very liable to carcinoma, besides those now enumerated by me. Those diseases he considers to be of the same family; 1st, because they often present in the early periods of their formation certain characters common to all of them, however much they may differ from each other in their subsequent periods. 2dly, because they all terminate in the gradual destruction, or transformation of the tissues they affect. 3dly, because they all have a tendency to affect several organs in the same individual. 4thly, because they all possess, though in various degrees the same reproductive character. Dr. Carswell describes two states of the new adventitious deposit, of which these diseases consist; in one it has little or no tendency to become organised, its form and arrangement appearing to be determined chiefly by external circumstances, and its formation and subsequent increase being entirely dependent on the nutritive function of the organ in which it is contained. In the second state, this deposit exhibits, on the contrary, a greater or less tendency to become organised; it possesses within itself properties, by means of which its subsequent arrangement and development are effected, independently of the nutritive function of the organ in which it is formed, except in so far as the materials of its growth may be derived from this source. The first example Professor Carswell calls *scirrhoma*, the second *cephaloma*. Here, however, when I speak of scirrhus and cancer, only those forms of disease are signified, to which these terms are ordinarily applied; the others will be considered hereafter. There are many interesting observations in Dr. Carswell's Illustrations of the Elementary forms of Disease, relative to cancer and fungus hæmatodes, which bring the subject completely into a new light. Thus, one circumstance which he observes, and which is new, I believe, to the generality of pathologists of this country, is, that numerous examples might be given of scirrhus, medullary sarcoma, and fungus hæmatodes, as they are commonly called, originating in the same morbid state, and passing successively from the one into the other, in the order now enumerated. Indeed, he says, that we often meet with all the varieties of what he terms scirrhoma and cephaloma, not only in different organs of the same individual, but even in a single organ. And of so much importance has it appeared to Professor Carswell to establish this fact, that the colored representations in his second fasciculus are chiefly devoted to its illustration. Sir Astley Cooper once informed me, that he removed a lady's breast, and the tumor, on examination, proved to be a true scirrhus, but a relapse took place, and the second disease in the same part was medullary sarcoma. In University College Hospital I have had several patients, in whom, after death, the two forms of cancer were found, either in different parts of the body, or blended together in the same part.

---

* For cases, see Warren on Tumors, p. 168. Also, R. W. Smith, in Dublin Journ. of Med. Science, vol. xii. p. 65.

Scirrhous cancer rarely occurs in subjects under thirty years of age, and not often in any individuals under forty or forty-five. The late Sir Everard Home, however, met with an instance of a true cancerous formation in the breast of a young woman under twenty. This was a rare occurrence, with reference to the breast, or scirrhus in general; yet I may state, that it is not very uncommon for scirrhus of the uterus to be met with in patients under thirty. We have had some melancholy instances of this fact amongst the patients of the Bloomsbury Dispensary.

In consequence of the female breast and uterus being particularly often the seats of scirrhous cancer, the disease more frequently afflicts women than men; and I may remark, that there is another circumstance, affording an additional reason for females being more liable to this intractable disorder; namely the change that occurs in their constitutions about the period of life when the menses cease. Hence, between the ages of forty and fifty, they often begin to suffer from scirrhous and cancerous affections.

It is generally believed, that various common tumors, ulcers, and pimples may change into malignant ones, and assume the cancerous action, under the influence of particular states of the constitution. Thus, when a female has a tumor in the breast, not originally of a malignant nature, another morbid action may be excited in the part about the period of life when the menses stop, and the disease may then assume the character of scirrhus or carcinoma. Nay, a tumor of the breast, brought on by a blow, and beginning to all appearances with common inflammation, in a seemingly healthy woman, long before this critical period of life, will sometimes leave a hardness behind that will then change into scirrhus and cancer. I suspect, however, that common adipous tumors less frequently degenerate into cancer than any other swellings; yet, the possibility of such a change is attested by Sir Benjamin Brodie.

Swelling is frequently considered not to be an essential feature of scirrhus and cancer. On this point, I think Sir Charles Bell has delivered one of the most accurate statements. In cancerous diseases of the breast, there is not always an increase in the dimensions of the whole breast, but often an actual diminution of its total bulk. But what is true of the breast, or mamma, is not true of the disease, more generally considered; for the proper structure of the mammary gland frequently either shrinks, or is compressed by the scirrhous deposit; and sometimes the quantity of surrounding fat is lessened by absorption; and the consequences are, that the whole mass is less than the natural breast, or than what the breast was previously to the commencement of the disease. Still it is a fact, that the disease is properly a tumor—it is, indeed, a preternatural growth—a new formation.

The difference in the feel of scirrhi materially depends upon the quantity of fat around them; if much of the adipous substance be absorbed, the irregular knotty form of the disease will be felt; but when a good deal of fat remains, the breast seems large, full and smooth, streaked perhaps with blue dilated veins, and having sometimes an ulcerated aperture in its centre.

However, after a scirrhus of the breast has existed a certain time, its character is generally denoted by the puckered state, and dull leaden or brownish color of the integuments, the knotty and uneven feel of the disease, the occasional sharp darting pains in the part, its fixed attachment to the skin above, and to the pectoral muscle underneath it, and the early retraction of the nipple, a circumstance produced by the extension of some of the scirrhous bands between the lactiferous ducts, whereby its spongy texture is destroyed.

A true scirrhous tumor of the breast, one disposed to be attacked by cancerous ulceration, is often known to a man of experience by its remarkable hardness; its great weight in proportion to its size, which is seldom considerable; the lancinating pains occasionally felt in it, and its close connexion with the gland of the breast; so that, when moved, this gland moves along with it. The diagnosis will also be much assisted by reference to the patient's age. With the exception of medullary cancer, few other diseases so completely involve in their ravages every kind of tissue, skin, muscle, mucous membrane, cellular substance, lymphatic glands, &c. In ordinary tumors, the skin does not usually become affected till they have attained a considerable size; but, in true scirrhus, near the surface of the body, the skin generally soon becomes adherent to the morbid mass, and both discolored and puckered.

Although a scirrhus of the breast may remain for months, and even for years, in a quiet state, without advancing to ulceration, the disease mostly ulcerates before the new formation has acquired great bulk. A large chasm is then commonly produced, partly by a sloughing, and partly by an ulcerative, process; and an excoriating peculiarly fœtid ichor is discharged, often in such abundance as to excite surprise in a person not accustomed to the view of this fatal disease. Its smell is also so different, so much more offensive than any other kind of discharge, that, when once acquainted with it, a surgeon never forgets it; and would afterwards recognise the presence of a patient with cancer, though out of his sight.

When the sloughs have been detached, partial but ineffectual attempts at reparation are made. Even granulations form, but hey are greyish, hard, warty, and endowed with but little vitality; never covering the whole surface, but rising only at certain points, and soon changing into fungous growths of extraordinary hardness. However, sometimes cancerous ulceration really stops, cicatrisation even occurs at particular points, and a degree of mitigation is experienced; but the part never heals to any great extent, never becomes healthy. The margins of the sore become indurated, irregular, and twisted in various ways; in some places everted, in others inverted, or turned downwards and inwards.

The disease entends to other parts, and often to remote situations; the absorbent glands especially become affected. The disease is propagated from one gland to another, so that, after all the axillary glands are affected, those which lie under the clavicle, in the neck, or in the upper part of the chest, or under the sternum, in the course of the internal mammary vessels, become diseased.

The absorbent glands are indeed frequently affected in an early stage, becoming much indurated, and having almost the density of cartilage; but sometimes becoming softened and broken down at several points, and containing a purulent or bloody fluid. The lymphatic vessels, entering or leaving the glands, also sometimes feel hard and wiry. In the advanced stage of cancer of the breast, so seriously is the function of the absorbents and veins of the nearest arm sometimes impeded, that the limb is in a constant state of painful œdema, and rendered completely useless. In ulcerated cancer, frequent hemorrhages take place from the fungous granulations; and these repeated losses of blood, joined with the constant pain and irritation of the disease, the want of sleep, and the progressive extension of the disorder to other parts of the system, soon bring the patient into the lowest state of debility. Nausea and disturbance of digestion now come on, followed by a distressing and incessant cough. Pains in the chest and oppression of the breathing increase from day to day; the patient becomes wan, sallow, and emaciated; the pulse rapid and faltering; and death at length puts an end to this scene of misery, often preceded by anasarca.

One deplorable effect of cancer in its inveterate form is an extraordinary fragility of the bones, which are apt to be broken by the most trivial causes, and even by the ordinary action of the muscles attached to them. In some of these cases, masses of scirrhous matter are deposited in the vertebræ, cranium, sternum, or long cylindrical bones, in lieu of their proper texture.

When cancer attacks the skin or a mucous membrane, an induration or warty lump is first produced, which afterwards ulcerates, and the sore has a particularly hard base. The ulceration gradually assumes the appearance of cancer, and soon cannot be distinguished from a sore that has been the result of scirrhus in other textures.

With regard to the *causes of cancer*, one important question is whether the disease is a local or a constitutional one? Its origin is frequently ascribed to blows, pressure, and external injuries; but, I believe, the whole history of cancer tends to prove, that, although it may follow a slight contusion, the scratch or irritation of a little wart or excrescence, that has been stationery and harmless for years, or a common inflammation or abscess of the breast, these circumstances can only be regarded as *exciting* causes, which would not have brought on the disease, had there not been a certain state of the constitution qualifying it for the production of the specific structure of a cancerous tumor, and the peculiar morbid actions by which the nature of cancer is distingushed.

I do not adopt the views of some surgeons, who get rid of this question by saying, that cancer is at first a local, and afterwards a constitutional, disease. If cancer were not always dependent upon constitutional causes, why should it be so rare in persons under thirty years of age? Why should it be so common in women at the critical change which affects their system about the age of forty-five? Why also should the disease be so frequent in particular families, as to excite the suspicion of its being hereditary? At all events, we must believe, that the disease is the effect of a specific action in the part, preceded by some peculiar state of the constitution, without which such specific action would not have taken place. It is true, that we occasionally, though rarely, meet with the true cancerous texture in young persons, and that we are not always able to trace any defect in their constitutions; but because we cannot discover it, we are not to presume that it certainly does not exist; and, so far as we can reason from other examples of the disease, we must infer, that when a scirrhous or cancerous disease forms either in a young or old person, there must be peculiarities in the constitution, without which such a complaint would not have been produced. As Professor Carswell justly observes, hundreds and thousands of individuals are daily affected with inflammation, without this local disease being followed by any other than its usual effects; a fact, placing in the clearest light the necessity of a previously existing modification of the economy, as the immediate and especial condition of the speciality of the adventitious formations, when they occur in conjunction with inflammation.

The same distinguished pathologist, in his highly valuable Illustrations of the Elementary Forms of Disease, refers to another very interesting fact relating to this part of the subject: I allude to the *formation of carcinoma in the blood.* According to his views, cancer is divided into *scirrhoma* and *cephaloma*, of each of which there are varieties, to which the terms *vascular*, *pancreatic*, *medullary sarcoma*, *fungus hœmatodes*, &c. are usually applied. He states, that the heterologous substance, which constitutes the two species of carcinoma, is present in the vessels which ramify in carcinomatous tumors, or their immediate vicinity; and that it can be traced from the trunks into the branches or capillaries; also, that it is found in vessels having no direct communication with a cancerous part, as when it is confined to a small extent of the vena portæ; and, lastly, in blood that has been effused into the cellular tissue, and on the surfaces of organs. He observes, that the divisions of the vascular system, in which the carcinomatous substance has been found, are the venous and the capillary. The formation of carcinoma in the blood, he says, cannot remain a matter of doubt; and he adopts the belief, that the presence of an organised product in the blood can have no other source but the blood itself, and cannot be introduced into this fluid by absorption. From this view of the origin of carcinoma, says Professor Carswell, its formation in the intimate structure, and on the free surface of organs, follows as a matter of course. The material element of the disease is separated from the blood, and deposited under a variety of circumstances, which modify, in a greater or less degree, the form, bulk, color, and consistence, which it afterwards presents in the several periods of its development. Dr. Carswell, therefore, does not agree with several pathologists, who limit the seat of cancer to any one tissue, nor does he ascribe its origin to any modification of structure, or special organisation. Here, however, we are to remember, that

Dr. Carswell's views of carcinoma comprise, as varieties of this disease, several cases which have usually been separated from it.

Scirrhous cancer is common at all ages between thirty and seventy. Sir Everard Home met with a single instance of the true scirrhous texture in a person only fifteen years of age; and Sir Astley Cooper, in all his long and extensive experience, never saw cancer in more than two individuals, who were less than thirty. The most common period for its commencement is the age of forty-five or fifty. Another fact, which is curious, in relation to influence of age on cancer, is, that when the disease occurs in persons of very great age, it is slow in its progress, and does not, in general, materially shorten their lives.

Cancer is known to all the world to be one of the most intractable diseases to which the human body is liable. When we consider it as a new formation—as an adventitious deposit, accompanied by the peculiar texture and organisation, which I have described, accompanied also by some peculiarity of constitution, or modification of the economy,—we must see, that the power of medicine can have little or no influence over the disease. Yet, we may not be justified in asserting, that scirrhus and cancer are absolutely incurable. I formerly attended a young woman, under thirty, in Great Ormond-yard, Queen-square, who died of scirrhous cancer of the womb, as ascertained by dissection, the parts having been removed, and preserved by Dr. Miller. Her mother, who was living in the same house, and far advanced in years, had had both her breasts entirely destroyed by cancerous disease, which had terminated in extensive sloughing. Here, no doubt, the whole scirrhous mass in each breast had been separated by the process established by nature for the detachment of the sloughs, and with them, I presume, the scirrhous bands, radiating from the tumor into the contiguous parts, were also thrown off, after which the ulcers healed like any common sores. The front of the chest on each side presents a most irregular mutilated appearance; the woman cannot now be less than eighty years of age.

As however this mode of termination of cancer is on the principle of extirpation, accidentally brought about by nature herself, strictly speaking, it may not affect the truth of the general observation, that cancer, whether in the state of scirrhus or carcinomatous ulceration, is positively incurable by any means, except such as are calculated to remove or destroy the whole of the parts affected. And, even when this is done, owing to the continued influence of constitutional causes, a recurrence of the disease, either in the same part or others, will always follow in a certain proportion of cases thus treated.

One circumstance proving the connexion of cancer with constitutional causes, is the greater frequency of the disease in women, who bear no children, than in others who have families. This is a fact universally known and admitted; yet a female may have children, and even many, without being safe from an attack of the disease. One woman is mentioned by Sir Astley Cooper as falling a victim to cancer, though she had been pregnant not less than seventeen times. I have attended several women, who died of cancer uteri, notwithstanding thny were mothers.

Another fact, in support of the opinion, that cancer is a constitutional disease, is the presence of the cancerous substance in the blood, either in the vessels, which ramify in a carcinomatous tumor, or its immediate vicinity; or in the vessels of a portion, or of the whole of an organ, to the former of which this substance is exclusively confined, and can be traced from the trunks into the branches and capillaries, or in vessels having no direct communication with an organ affected with the same disease.*

With reference to the prognosis and treatment of scirrhus and cancer, I may observe, that they are amongst the most intractable and fatal forms of organic disease to which the human body is liable. When we consider scirrhus as a new formation, as an adventitious growth or deposit, accompanied by the peculiar texture, which I have endeavored to describe, we must naturally suspect that it is not a case over which medical surgery can have much power. Indeed, it is the belief of the most experienced and careful observers, that cancer, whether in the form of scirrhus, or sarcinomatous ulceration, is absolutely incurable by any means except those plans, which bring about the total removal or absolute destruction of the parts affected. And even when this is done, a recurrence of the disease, either in the neighboring tissues, or in remote parts and organs, will follow in a considerable proportion of the cases thus treated: another fact, confirming the truth of the doctrine, that cancer is a disease dependent on constitutional causes. When a scirrhous cancer is so situated as to admit of being entirely removed with the knife, no time, I think, should be lost in attempting to disperse the induration, or cure the ulcer, by other means. It is only while doubts prevail about the true character of the complaint, or while it is in a very early stage, that it is generally advisable to try plans which have in view the dispersion of the hardness, or the healing of the sore by external or internal remedies. The ground, on which I offer this advice, is, that all the medicines and applications, described in every pharmacopœia in the world, have already been tried for the relief and cure of cancer in thousands of instances, without the slightest advantage; and in innumerable cases, the time employed in the trial of them has offered an opportunity for the disease to extend from the part originally attacked, and which might easily have been taken away at first, to other parts not admitting of removal, and the patients have died, without having had that chance of being saved, which a timely operation would have given them.

---

* See Dr. Carswell's Illustrations of the Elementary Forms of Disease; Faciculus 2.

We occasionally hear and read of cancerous affections being cured by various medicines and applications. But the question is, whether they were diseases, really attended with the true scirrhous formation and structure, or genuine carcinomatous ulceration ? Numerous swellings, indurations, and ulcers, have more or less resemblance in their outward characters to scirrhus and cancer; and such are sometimes dispersed, or healed; but that a disease, accompanied by the genuine scirrhous texture, the heterologous substance that distinguishes it, can be cured by medicine, or any local means, not acting so as to destroy the part affected like caustic, is a proposition, against which the voice of experience is loudly raised.

Believing in this fact myself, I shall be brief in the enumeration of a few of the principal medicines, which have been repeatedly praised for their efficacy in scirrhous and cancerous cases; for, according to the view which I have taken of the subject, they have been extolled without good foundation, and, in the trial of them, other diseases have been generally mistaken for those now engaging our attention. *Conium maculatum*, or *hemlock*, was at one time praised up to the skies as a remedy both for cancer and scrofula. It is yet confided in by Recamier, who combines with it an allowance of only one third of the patient's ordinary quantity of food, and makes him take as ordinary beverage a weak infusion of bark. The extract of *belladonna* is a medicine that can only be given in very small doses, the effect of which is not to cure or stop scirrhus, or cancer, but to diminish the pain of the complaint. As for *arsenic*, in the form of the liquor arsenicalis, I have frequently given it the fairest trial in scirrhus and cancer; and am sure, that it has no power over them; though certain troublesome and inveterate ulcerations and tubercular diseases about the nose, lips, and other parts of the face, and on the tongue, will sometimes yield to it. Certain malignant-looking sores on the face, reputed to be of a cancerous nature, were cured, under Mr. Carmichael, by the *sesquioxide* or *phosphate of iron*, with the occasional use of purgative medicines. The dose of these preparations of iron varies from a scruple to a drachm twice a day. They are now generally acknowledged to possess no specific virtues against true scirrhus and cancer. As for *mercury*, though it has the power of promoting the absorption of various indurations, and of curing different forms of the most obstinate ulceration, no modern surgeon has any confidence in its usefulness as a medicine for cancer. When the digestive organs are disordered in a patient laboring under a scirrhous affection, small doses of the blue pill, or compound calomel pill with leeches on the epigastrium, or hypochondrium, and aperient medicines occasionally, will sometimes improve the general health, and put the patient into a better state for an operation; but neither this nor any other medical plan, will serve to disperse a true scirrhus. The *muriate of barytes* has been tried, but is now given up, as entitled to no confidence. Living altogether on a *milk*, or *vegetable* diet, or a diet just sufficient to keep the body and soul together, something very nearly approaching to starvation, is one of the schemes which have been resorted to. In the periodical works of the day, we read of cancerous diseases yielding to *iodine*. I have frequently tried it for such complaints in the breast, uterus, and lips, but without success.

Amongst the favorite *topical applications*, are the *liquor arsenicalis* properly diluted, and Dupuytren's powder, consisting of ninety-six parts of calomel, and four of oxide of arsenic. Strong *arsenical pastes* are dangerous applications. I remember a patient being poisoned with them; he had a cancerous ulcer of the face; the surgeon covered it with the paste; and he died in a few hours from the absorption of the arsenic, and its deleterious effects on the system. If any surgeons are yet bold enough to attack cancerous disease with caustic (which I am not), let them abstain at all events from arsenic, and employ *pure potash*, though, I think, they will often kill the patient even with this.

Narcotics, in the form of plasters, are sometimes employed, particularly *opium*, *conium*, *hyoscyamus*, and *belladonna* blended in various proportions with the ordinary brown soap plaster. The *watery solution of opium*, and the *liquor opii sedativus*, are common applications for all kinds of malignant ulcerations. In addition to these articles, I will merely refer to *carrot poultices*, *fermenting poultices*, *a solution of one ounce of the sulphate of iron in one pound of distilled water;* a *paste* composed of *sesqui-oxide of iron* blended with water, or sprinkling the ulcer with the powder, the solutions of the chloride of *lime and soda;* and covering the scirrhous part with a piece of hareskin, or fleecy hosiery, so as to protect the disease from the influence of vicissitudes of temperature, and the injurious effects of accidental blows.

Pressure was recommended by Young, as a means of curing cancer, but the trials made of it in the Middlesex Hospital, and the report of Breschet, are decidedly unfavorable to the practice. I have tried it in two or three examples, without success. In France, however, Recamier is still an advocate for it. According to Dr. Carswell, the influence of pressure in favoring or retarding the development of carcinomatous tumors, is conspicuously seen in those situated near the surface of the body.

As none of these plans and medicines will cure cancer, we are to consider what benefit may be obtained by extirpating the diseased part.

If the operation be done early, and performed on the principle of removing, not merely what is obviously diseased, but a good deal of the substance around the scirrhus or cancer, the result will frequently be a permanent cure, so far as that part is concerned. But the cure is not a certain thing. Indeed, after a cancerous tumor has been extirpated, whether the disease be indolent, or painful, small, or recent, there is no certainty that the disease will not return. On the other hand, it is not certain that the disease will return, even when it has made considerable progress previously to the operation. Yet, it is an undoubted fact, that the more recent the disease is, the less are the chances of relapse.

Hence, as we have no medicine that will cure scirrhus and cancer, we should recommend an operation for their removal as soon as no doubt exists about their nature.

When it is impracticable to remove the whole of the diseased parts, it is a rule in surgery not to undertake an operation at all. The partial extirpation of a true scirrhus, whether by caustic or the knife, is sure to convert the disease into a fatal painful carcinomatous ulcer.

Another maxim in surgery is, never to perform the operation for the removal of a cancerous tumor when there is reason to believe, that the disease is not confined to the part, but has already extended itself to internal glands and other textures, more or less remote from the original seat of the disease. My experience teaches me, that, if an operation be performed where the integuments, covering a scirrhous breast, are thickly studded with hard pale tubercles, the patient will be almost sure to have a return of the disease in the skin, though every part of it visibly diseased may have been removed.

What good can arise from cutting away a cancerous breast, when, perhaps, all the absorbent glands about the axilla, neck, and within the sternum, are similarly affected? Where can be the prudence of cutting away an external scirrhus when there are cancerous deposits in the lungs, liver, bones, or other deep-seated textures?

Surgeons do not decline to operate when the axillary glands are diseased together with the breast; and provided the whole disease in each situation can be thus removed, the practice may be right; but, certainly, the extension of the disease to those glands very materially lessens the chance of a permanent cure. It shows that the diseased action has passed to organs more or less remote from the original affection, and that the system may be inveterately under its influence. Camper believed, that a sure sign of the incurability of a cancerous breast consisted in a shooting pain between the second and third ribs. He was convinced, that such pain denoted the extention of the disease to the lymphatic glands under the sternum.

Is it right to operate when the disease is in the ulcerated state? The answer must depend upon circumstances. If the whole of the diseased parts can be removed, if the viscera of the chest and abdomen appear not to have suffered, and the lymphatic glands are not extensively affected, the operation is justifiable, though its chances of success are much less than those where the case is only a scirrhus, under similar conditions. The lips, however, have been removed in the ulcerative stage, without the disease afterwards extending itself to the submaxillary glands, or any relapse taking place. The same fact has been exemplified after the extirpation of portions of cancerous tongues.

When the opportunity for operating has passed away, palliative treatment is all that can be attempted. Appeasing the pain by the application of the watery solution of opium, or dressing the ulcer with the liquor opii sedativus, or with an ointment containing one drachm of the powder of opium in every ounce of lard, are rational methods. I had lately one patient with a dreadful carcinomatous ulceration of the breast, who found no dressing afford her so much ease as the common spermaceti ointment. The fœtor may be lessened by applying the chloride solutions; but they give not the ease derived from other dressings. To a scirrhus which it is not judged advisable to remove, we may apply soap plaster, containing a proportion of the extract of belladonna or hyoscyamus; or we may simply cover the part with a piece of soap plaster or soft fur. On account of the pain, the acetate or hydrochlorate of morphia may also be prescribed. This practice is most particularly called for in examples of ulcerated cancer. Where the agony is great, and the disease incapable of removal by the knife, all that can be done is to render the patient's journey to the grave more free from misery.

The success of an operation will materially depend upon the whole disease in the part—every atom of it—being completely extirpated. Hence, we should always make a free removal of the skin and cellular tissue around a scirrhous tumor, as the fibrous bands frequently extend a considerable distance round the perceptible induration and swelling. In a certain number of instances, however, a relapse will unfortunately take place, whatever be the precautions taken in the performance of the operation. Still the prospects of a radical and permanent cure are more promising when the operation has been properly performed, and strict attention is afterwards paid to the patient's general health. Hence, when we take away a scirrhus, we ought not to think that we have fulfilled the whole of our duty to the patient; but prescribe such medicines, and regimen, as will be likely to produce a beneficially alterative effect on the constitution.

When the disease extends only to one or two of the axillary glands, and the patient seems to be free from organic disease in the chest and abdomen, we may perform the operation; but the diseased gland or glands should be removed with the knife, directly after the scirrhous breast has been extirpated.

MEDULLARY CANCER, ENCEPHALOID TUMOR, OR FUNGUS HÆMATODES.

The latter name was adopted by Hey, in consequence of its tendency to throw out, with great rapidity, a large bleeding substance, after ulceration of the skin has taken place. It is sometimes called *soft cancer;* and, by Abernethy, was named *medullary sarcoma*, from its resemblance to the medullary substance of the brain. It is, in fact, very similar to the substance of the brain in all chemical and physical properties. Most commonly it presents itself in masses, contained in fine membranous partitions: but it has three varieties, as originally pointed out by Laennec. The first is the *encysted*, which varies from the size of a filbert to that of an apple. The *unencysted*, which may be very small, but, in other instances, obtains the magnitude of a child's head. Its exterior is not so irregular as that of the encysted, though divided into lobules, with fissures between them. The *infiltrated* or *diffused*, consists of masses, which are not circumscribed, and the medullary substance presents a diversified appearance, in consequence of its being blended in various proportions with the tissues amongst which it is produced. It is generally of the same consistence as the cerebral medulla; but sometimes much softer. It varies also in color: in some instances, it is quite white; in others light red; and it has occasionally been found to be of a deep red color. A section of the tumor exhibits numerous bloody points. A vascular organisation is conspicuous in it, and as the coats of its vessels are remarkably delicate, the circulation of the blood through them is readily interrupted; hæmorrhage from congestive rupture takes place; and the effused blood is mixed with the brain-like matter.* When superficial, medullary cancer begins as a colorless swelling, soft and elastic to the touch, unless bound down by a fascia, in which case it has a firm tense feel. When immediately subcutaneous, it is elastic, and hence liable to be mistaken for a tumor containing fluid. When it occurs in the testicle, it is frequently supposed at first to be hydrocele.

Like cancer it has a tendency to spread to the absorbent glands, which become converted into a similar substance. In every sense of the expression, it is a new formation, an adventitious growth, whether situated in the cellular membrane, in the tissue of the muscles, in that of the viscera, or within the orbit, or in any cavity or on any surface of the body. When it occurs in deep-seated parts, it has an invariable tendency to make its way to the surface, and when this happens, a considerable swelling arises, the skin at length becomes thin and discolored, and from being at first smooth, now projects irregularly; openings are formed in these projections, and a medullary growth springs up, which sometimes bleeds profusely. It is only at this period of the disease that the name of fungus hæmatodes is at all applicable; and even now it is not very correct, as the mass is not a fungus, but a substance of medullary consistence. Medullary cancer seems to be a constitutional disease, and rarely confined to one organ. It has been observed in the eye, the brain, the lungs, the heart, the liver, the spleen, the kidneys, the bladder, the uterus, the ovaries, the mammæ, the mesenteric glands, the dura mater, the bones, and the thyroid gland, of which there is a fine specimen in Mr. Langstaff's museum. It may commence in almost every texture, or upon any surface. Sometimes it originates in the antrum, from which it may extend to the brain, through the orbit, or outwards through the cheek, or into the mouth, or nose.

---

* See Carswell's Illustrations of the Elem. Forms of Disease; Fasc. 2.

An early symptom of this terrible and unfortunately common disease, is a wan, pale complexion, such as is remarkably indicative of what may be termed a fatal organic disease. The patient generally dies hectic. One of its differences from scirrhous cancer is, that it contains within its substance no ligamentous bands, nor central hard nucleus, but consists of a soft pulpy matter contained within the septa, composed of a fine delicate membrane. In order to be able to see its structure well, we should subject it to maceration or the action of alkalies. A scirrhous tumor is generally firm, hard, and incompressible from the very first; whereas there is a softness and elasticity about fungus hæmatodes, at once constituting quite a different character. The parts in this latter disease are not destroyed by ulceration, as in cancer; but, after the skin has ulcerated, a medullary bleeding substance protrudes. While the new deposit in scirrhous cancer, also, has little or no tendency to become organized, that of medullary cancer exhibits a greater or lesser disposition to become so. Fungus hæmatodes frequently attacks the liver, the spleen, the kidneys and lungs, *primarily;* whereas it is alleged by some pathologists, that scirrhous cancer only attacks these organs *secondarily;* a point, however, deserving of further investigation. Medullary cancer is not uncommon in young subjects, and persons below the middle age; whereas cancer chiefly attacks individuals between the ages of forty-five and fifty, or older persons. With regard to the treatment, we know of no medicine that will correct the state of the constitution upon which this disease depends. The only chance of curing it, is by the removal of the tumor at an early period of its formation, before the lymphatic glands and other parts have become affected. Thus, if the disease has extended up the spermatic cord, or to the lumbar glands, castration will be of no avail. I am of opinion, that the viscera generally become diseased much sooner in medullary tumors externally situated, than is generally supposed. I am now speaking of that form of them, which comes under the care of surgeons, where the surface of the body, or the limbs, are the seats of the disease. This fact accounts for the general failure of operations; and induces many judicious surgeons to condemn them altogether.

Notwithstanding there is every reason for believing medullary cancer to be a constitutional disease, and we find, that after an operation, there is usually even a greater disposition to relapse, than is manifested in examples of scirrhus and cancer, experience occasionally brings forward cases forming exceptions to this statement. I removed a testicle affected with fungus hæmatodes from a man in Newton Street, Holborn, who recovered, and continued well a long while afterwards; and we sometimes hear of the same disease in the eyes, breast, and limbs, being effectually extirpated by operation, without being followed by any return of the complaint. Unfortunately, the contrary more generally happens, so that the prognosis should be qualified by a reference to this important fact.

MELANOSIS.

The *black cancer* of Dupuytren, the *melanoma* of Professor Carswell, is characterised by the formation of a brownish, deep blue or black inorganic matter in various textures and cavities of the body, especially those lined by a serous membrane. The shades of its color vary in different examples, sometimes presenting only a yellowish or light brown, sometimes a dark brown, and frequently the deepest black.

The scientific arrangement of melanotic diseases, partly suggested by Bayle and Laennec, but improved by the labors of Breschet and Carswell, seems to me to convey the most correct idea of their principal varieties. Thus, melanosis is divided by the latter pathologist into *true* and *spurious;* the *first* comprising those cases, in which the formations or products depend on a change taking place in the process of secretion, whence the natural color of certain parts of the body are derived; the second comprehending cases, in which either a carbonaceous matter has been introduced from without, or in which the appearances are owing to the action of chemical agents on the blood, or to the mere stagnation of the latter fluid. According to Professor Carswell, the most frequent seat of *true melanosis* is the serous tissue, more especially where this constitutes the cellular element of organs. Here the melanotic matter is formed after the manner of *secretion*, accumulates in the cells, of which the serous tissue is composed, and gradually acquires the form of tumors of various sizes. A similar mode of formation of this matter takes place much more conspicuously in loose cellular tissue, and particularly on extensive serous surfaces, like those of the pleura and peritoneum.* Another mode of formation is pointed out by Dr. Carswell, where the melanotic matter is deposited in the substance, or molecular structure of organs, after the manner of *nutrition;* and, lastly, as he has further explained, the melanotic matter, like that of cancer, or medullary sarcoma, is sometimes formed in the blood, chiefly in the venous capillaries, and under circumstances which show that it must have been formed in these vessels. There are not less than four modifications of true melanosis.

1. *Punctiform melanosis*, the *mélanose infiltrée* of Laennec, in which the black coloring matter appears in the shape of minute points, or dots, either grouped together in a small space, or scattered irregularly over a considerable extent of surface. These appearances are most frequently exhibited in the liver, and, when a section is made of it, the surface seems as if it had been sprinkled with soot or coal dust.

2. *Tuberiform melanosis*, which is by far the most common, answers to the *concretions mélaniques* of French pathologists. Sometimes the tumor is not larger than a millet seed, but occasionally it is equal in bulk to a child's head, or even of more considerable dimensions. Of this size, however, it is chiefly seen in the horse; for, in the human subject, we rarely meet with an instance of its exceeding the size of an egg or an orange, and commonly it is much smaller. It is in the loose cellular and adipous tissues that melanotic tumors are disposed to attain extraordinary magnitude. Their great size seems to depend upon the agglomeration of numerous small tumors. According to Professor Carswell, when the tumor is single, it is always of a globular or ovoid shape, but, in the contrary circumstance, lobulated. In compound tissues, he has observed it to be most frequently a *single* tumor, but in the cellular and adipous tissues *aggregated*. In the liver, single melanotic tumors of large size are more common than in any other organ of compound structure. Melanotic tumors may be either *encysted* or *without a cyst;* the encysted being chiefly met with in the cellular and adipous tissues. The *tuberiform* melanosis of Professor Carswell, however, is not confined to the cellular and adipous tissues, or parts abounding in them, but may occur on the surface of the peritoneum, or that of the pleura.

3. *Stratiform melanosis*, the *mélanose membraniforme* of Laennec, occurs only on the surface of serous membranes. In its first stage, the part seems merely stained with the melanotic matter; in the second, a distinct layer of this substance is deposited on the surface of the serous membrane. Its consistence is generally that of jelly, and, as it is enclosed either in a soft spongy cellular tissue, or fine transparent serous membrane of new formation; it has a pul-

---

* See Dr. Carswell's Illustrations of the Elementary Forms of Disease; Fasciculus 3.

py feel, but is not removed by the finger or scalpel passed over it, unless some force is employed. In certain cases, it forms a black coating, in appearance very much like what is produced by Indian ink.

4. *Liquiform melanosis*, the last of Dr. Carswell's species of true melanosis, the *mélanose liquide* of Breschet, may occur in natural or accidental cavities, and also within a melanotic tumor itself, in consequence of what French pathologists describe as the *softening process* in the centre. The cavities of the pleura and peritoneum are the chief natural cavities, in which the *liquiform melanosis* presents itself, and here only in small quantity. What has been described as this form of melanosis in mucous cavities, seems to Dr. Carswell to be owing to the changed color of the blood, either effused in such cavities, or contained in its proper vessels, and acted upon by some external chemical agent, consequently they are spurious cases. Ovarial cysts furnish the best examples of *accidental cavities*, in which *liquiform melanosis* is sometimes seen. The consistence of melanosis is exceedingly diversified. In the large cavities, it is never solid; in the cellular and adipous tissues one or two cells may contain liquid black matter; but, in the dense texture of the cutis, the smallest tumor may be as hard as cartilage.

The *spurious forms of melanosis* depend either upon the introduction of carbonaceous matter into the pulmonary tissue in the process of respiration, or upon the action of acids or other chemical agents on the blood, situated in, or upon parts, or, lastly, upon the simple stagnation of this fluid.

Melanosis frequently originates in the subcutaneous cellular tissue, or in the cellular and adipous tissue, behind the peritoneum.

The most striking example of its circumscribed existence in adipous tissue is specified by Dr. Carswell to be that, in which the disease occurs in the *appendiculæ epiploicæ*, which are sometimes converted by it into a homogeneous solid mass of melanotic matter.

Melanosis may take place in various parts of the same individual, as the eye, the skin, the liver, the lungs, the heart, the pancreas, and the peritoneal covering of the viscera. From this fact, one may infer its connexion with a constitutional cause.

The bones are not often the seat of melanosis. In one example described by Dr. Alison, the whole of the sternum, the anterior portion of the ribs, and a great part of the parietal and occipital bones were black, more brittle, and of a softer consistence, than natural; but without enlargement, or caries. The periosteum was but little changed; but the dura mater was stained black, and the pleura studded with very dark colored tubercles.

One interesting fact, explained by Professor Carswell, is, that the fluid of melanosis may be found in natural or artificial cavities, without its being the product of their secretion. This happens, when melanotic tumors perforate the sides of those cavities, and pour their fluid contents into them. This has been observed in the thorax and abdomen; and, in one case, a melanotic tumor had perforated the right lateral ventricle of the brain, in which was found a considerable quantity of black fluid, some of which had passed into the the third and fourth ventricles, and thence into the theca vertebralis.

Melanosis of the brain is rare. In the museum of University College is a specimen of a small melanotic formation on the cerebellum of a child, that lived only three days from its birth. No doubt, therefore, in this instance the disease must have commenced in the fœtus.

The matter of true melanosis has no smell—a circumstance, by which the disease may always be known from the effects of gangrene.

With respect to the symptoms of melanosis in the living subject, the disease may at first produce little or no pain; but a sallow complexion, excessive debility, and anasarca frequently come on before its termination. In some instances, however, great general indisposition, and most severe pain in various parts of the body, are experienced from the first; and, occasionally, the patient is rapidly destroyed in the short space of three or four weeks. In common examples, I believe, it does not cause a vast deal of suffering, except when nerves are involved in it, or compressed by it.

The matter of melanosis is completely insensible— it is only an inorgancic secretion, or deposit—sometimes produced in textures, or upon surfaces otherwise apparently healthy and natural—sometimes formed in parts, affected with chronic inflammation—and sometimes co-existent in the same mass, either with scirrhus, cancer, or medullary deposit; a point, in which the researches of Professor Carswell agree with those of the late Dr. Armstrong. These facts explain why melanosis is sometimes described as a malignant disease, and sometimes as having this character but very rarely.*

Melanosis is a more common disease in horses, than the human subject; but it is principally met with in those of a white, or grey color; a fact, corroborating the doctrine of its origin from constitutional peculiarity. As Professor Carswell remarks, the circumstance is also favorable to the theory, which ascribes the origin of melanosis to the accumulation in the blood of the carbon, naturally employed to color different parts of the body, as the hair, rete mucosum, and choroid coat of the eye.

From the chemical analysis, it would seem, that the substance of melanosis consists of fibrine, a black coloring matter, a small quantity of albumen, chloruret of sodium, oxide of iron, water, subphosphate of lime, and a few other salts in small proportions; and it is the general opinion, that the melanotic matter is essentially composed of the constituent elements of the blood. The coloring matter seems also to be a highly carbonised principle.

---

* See Warren on Tumors, p, 25.

No remedy is known of for melanosis. Its causes are as obscure as those of cancer, fungus hæmatodes, tubercles, and other new and adventitious formations. The only chance of benefit depends upon the early removal of the disease by operation, when the situation of the part affected will admit of it. An eye, affected with melanosis, has been extirpated, without any relapse having followed the operation at the end of two or three years; so have melanotic tumors of the skin and cellular tissue. Melanotic formations under the tails of horses have likewise been frequently cut away with permanent success. These facts prove, that melanosis in some situations has more chance of effectual relief by operation, than medullary cancer.

SCROFULA, OR STRUMA,

Commonly called the *king's evil*, from the superstitious notion formerly entertained, that it was curable by the royal touch, frequently presents itself in the form of glandular enlargements under the skin—swellings whose progress is in general remarkably indolent,—which soften very slowly,—and at length frequently suppurate and burst, after which they remain a greater time as ulcers, and, after healing (which they do very tediously), often leave behind them callous irregular scars, which can never be effaced.

Sometimes the disease occurs in the substance of the cutaneous texture, which it disfigures and alters in a most disgusting manner, and very often it attacks the ears, the eyes, the eyelids, the nostrils, and the lips, which it thickens and deforms in an extraordinary degree. In other examples, we find it fixing upon organs more deeply situated; as the bones and joints; or obstructing the organs for the conveyance of the lymph and chyle; or giving rise in the lungs, the peritoneum, and other parts, to those tubercular diseases, which, in this climate at least, are one of the greatest causes of mortality.

Scrofula will not admit of a short and satisfactory definition, and this, notwithstanding our familiar acquaintance with its usual seats, and its ordinary ravages and course. I may observe, however, that it is *characterised by a remarkable propensity to chronic inflammation of the lymphatic and mesenteric glands.* The absorbent glands of the neck, and others under the jaw, are more frequently attacked by scrofula than those of any other region in the body; and perhaps their being more exposed to vicissitudes of temperature, and to the irritation of diseases of the scalp, which are so common in children, may afford some explanation of this fact. Next, perhaps, the *mesenteric glands* are most frequently disorganised by it; and it is not unusual to find it affecting the *glands in the groin*, and even those in the *axilla*, and other situations. Indeed, the absorbent glands of every part of the body are liable to scrofulous disease.

Scrofula always produces in the system a tendency to the formation of chronic abscesses, not merely in and about the absorbent glands, but in the general cellular tissue of the body.

As already mentioned, it likewise creates a disposition to the origin of *tubercles in the lungs*, *liver*, *brains*, *spleen*, and other internal organs. The most frequent seats of scrofulous tubercles in adults are, first, the lungs, and then the small intestines; but, in children, the bronchial glands, the mesenteric glands, the spleen, the kidneys and the intestines, in the order here enumerated.

If we regard tubercular phthisis as a scrofulous disease, it will make a material difference in the comparative estimate of the frequency of scrofula in children and grown up persons.

Scrofula is accompanied by a tendency to certain morbid changes in the spongy and cancellous texture of the bones, and also in the synovial membranes.

In the common language of surgery, we frequently say, that a person is scrofulous, though he may not have any visible disease about him; but merely certain appearances, usually regarded as emblems of a scrofulous constitution, or of a predisposition to scrofula. Thus a fair complexion light-colored hair, a fine thin delicate skin, exhibiting the minute ramifications of vessels, full sized, rather dilated pupils, and a remarkable whiteness of the albuginea of the eye, a tenderness of the edges of the eyelids, a swelling of the upper lip, with some thickening of the alæ and tip of the nose, are known to denote a scrofulous constitution. In many instances, the ends of the fingers are broad and clubbed, as the expression is, and the belly protuberant. Perhaps, the doctrine of a fair complexion and light hair being indications of a predisposition to scrofula, may have been carried too far, and certainly I should have been inclined to suspect, that it had arisen merely from the accidental circumstance of the greater number of children in this country being fair, and having light-colored hair, had I not found it noticed by Alibert and other French pathologists, that scrofula is most frequently seen in France in the same description of children, where we know that dark complexions and black eyes predominate. It is not, however, to be supposed, that a dark complexion is an absolute protection, for many scrofulous persons have dark skin and hair; and every surgeon of experience knows how subject the negro and other individuals of the dark races are to scrofula, when brought to this damp, cold, and variable climate.

It is frequently difficult, perhaps sometimes impossible, to draw with precision the line between scrofulous and some other diseases, because there is an insensible transition or gradation from one to the other. Yet certain forms of diseases present themselves daily, in which there can be no hesitation in pronouncing them to be scrofulous. Such are particular indolent swellings and abscesses of the lymghatic glands of the neck, certain diseases of the joints and spinal column, and various tubercular affections.

Children are more liable to scrofula than grown up persons, the period of life most exposed to its attack being from infancy to puberty. Nay, if tubercles are to be regarded as unequivocal effects of scrofula, as many of the best pathologists believe, the disease may commence in the fœtus; and there are in my friend Mr. Langstaff's museum portions of lung, taken from a fœtal subject, and evidently containing completely-formed tubercles.

As puberty approaches, the disposition to every form of scrofula, except that of pulmonary tubercles, lessens, and those who have suffered from it in their childhood, sometimes become free from it, and bid defiance to its further annoyance. Females are generally considered to be rather more subject to scrofula than males. The disease is well known to be neither infectious nor contagious; not being communicable from one person to another by inoculation, nor through the atmosphere. The idea that scrofulous nurses may impart the disorder to children, is one that is at present universally renounced.

It appears, then, that scrofula may make its appearance in almost any texture of the body, and is not, as is sometimes conceived, peculiar to the lymphatic glands, though they are perhaps more susceptible of it than any other parts. The glands of the neck and those of the mesentery undoubtedly come within this remark; and next to these organs I may say, that the skin, the lungs, the eyes, the ears, and the spongy parts of the bones, are most frequently the seats of scrofulous disease.

Scrofulous inflammation is generally remarkable for the slowness and indolence of its character. Its attack is always more insidious, and its progress much slower, than the invasion and advance of phlegmonous inflammation. The acute pain, the throbbing, the firm circumscribed swelling, the bright red color, and the quickness of the changes, which attend all simple healthy inflammations, may be said to be absent from scrofulous inflammation as it most usually presents itself. Neither does scrofulous inflammation, when situated in a lymphatic gland, or any ordinary texture, commonly produce at first any febrile disturbance; yet, when scrofula makes progress, or attacks organs of great importance in the animal economy, or extends its ravages to the large joints, the degree of constitutional derangement and of hectic is often such as to form a state of considerable and urgent danger.

Scrofulous inflammation near the surface of the body, often begins with a soft swelling of the part affected, which is frequently one of the lymphatic glands. The covering of the gland becomes slightly thickened, and the gland itself has a doughy feel. As the swelling increases, it becomes more elastic, or even communicates the sense of a fluctuation; and, in this stage, a degree of induration is generally noticed under and around the tumor, with a more or less red or livid color of the skin. If a puncture be now made in the swelling, a thin fluid is discharged, mixed with flakes of a curdy substance, composed of albumen, but only in trivial quantity, and rarely in the shape of good pus. The edges of the puncture next inflame, and the opening becoming larger, in consequence of the ulcerative process, a dark yellow or brown sloughy-looking substance may be seen within it: and betwixt this substance and the skin a probe may be passed freely all round the sore. Indeed, it is one of the characters of scrofulous abscesses, when formed near the surface of the body, always to detach the skin extensively from the subjacent parts. If the disease be allowed to take its own course, without being punctured, a part of the skin at length becomes very thin, and of a light purple red color; afterwards bursting and discharging a thin fluid-like whey, with which flakes of albumen, and occasionally pus, are also blended. The redness continues, the surrounding hardness remains, the ulcerative process advances, and the disease is now converted into a *scrofulous ulcer*, which is generally not much disposed to heal. The cavity and sides of many deep ulcers and abscesses, resulting from scrofula, are noticed by Mr. Wardrop to be covered with a tough yellow fibrinous incrustation, that produces an impediment to the formation of granulations; and he accounts for the usefulness of laying open scrofulous abscesses partly on the principle of its promoting the separation of this extraneous incrustation within them.

Scrofulous ulcers originate either from glandular swellings, which inflame and break; or else the skin spontaneously inflames in various places, and ulcerates. In general they are not very painful; their edges are hard, irregular, and undermined. Their circumference, and indeed the ulcers themselves, are of a pale red, or purple color; their bottom is here and there covered with a yellow curd-like substance; and the matter secreted by them is thin. Although it is not the most usual disposition of a scrofulous ulcer to be very painful, it is occasionally met with in this latter state, and particularly when scrofula is excited by a course of mercury, or the ulcer is complicated with dead or carious bone. The cicatrix of a scrofulous sore generally exhibits a very puckered appearance, with small portions of projecting skin, and even complete bridges of it, allowing a probe to pass under them. The healing of a scrofulous sore is often followed by the advance of other tumors to suppuration, or the formation of new ones. Thus one train of evils succeeds another, till the discharge and irritation together seriously weaken the patient; or the disease fixes on some organ of high importance in the economy, followed by hectic derangement, extreme debility, loss of sleep and appetite, colliquative perspirations, diarrhœa, and a state of more or less urgent danger.

Google

One of the common effects of scrofula is a remarkable tendency to the formation of *chronic abscesses*. Their frequent occurrence in the absorbent glands I have already noticed. The same disposition to suppuration is also exemplified in discharges from the ears, nose, vagina, and lachrymal passages, so common in scrofulous children. A similar tendency is likewise often manifested in the cellular tissue of different regions. The cases termed *psoas*, or *lumbar abscesses*. have long been very correctly regarded as scrofulous: in fact, many patients, afflicted with them, have, or have had scrofula in other forms. Most of those indolent collections of pus, which are termed by the French *abces froids*, are true scrofulous diseases; and in many instances originate from the irritation of a diseased bone, or joint near them. It is indeed of great practical importance to remember, that many scrofulous abscesses do not begin with disease of the soft parts, but with morbid changes in the synovial membranes, cartilages, or spongy parts of the bones. Lumbar abscesses are generally connected with disease of the vertebræ; and scrofulous suppurations in the hand or foot are mostly a secondary effect of disease of the phalanges of the fingers or toes, or of the carpal or metacarpal, or of the tarsal or metatarsal bones. Many abscesses of the ear in scrofulous children are likewise complicated with necrosis of the meatus auditori s, or even of the ossicula within the tympanum. While the lymphatic and mesenteric glands, the skin, the eyes, the ears, and joints are particularly liable to scrofula in children and young subjects, the lungs become after the arrival of puberty equally prone to tubercles, which are now set down by the greater number of pathologists as a form of scrofulous disease.

Those who doubt the accuracy of this doctrine, observe, that the time of life for scrofula is from childhood to puberty, while tubercular phthisis does not usually show itself before the latter period, and prevails most extensively between the ages of twenty-five and thirty-five; that is, in the very stage of life when the tendency to scrofula appears to terminate. They remark that individuals often reach the worst stages of scrofula, without exhibiting any symptoms of tubercular formations; while, on the other hand, these latter very frequently take place unaccompanied by any scrofulous affection. It is declared, that in Scotland, Belgium, Dauphiny, Le Valais, Lower Brittany, and some other parts of the world, there is less phthisis than in other countries, where scrofula is much less common. These arguments, plausible as they may seem, do not appear to me to carry great weight; because tubercles, regarded as a form of scrofula, are admitted to be influenced in their production by the age of the individual, and, no doubt, also under particular circumstances, by the climate and country in which he resides. Hence the tubercular varieties of scrofula may bear a larger proportion to other forms of this disease in one place than another, and always do so between the ages of twenty-five and thirty-five. Thus we know, that tubercles and other scrofulous diseases more frequently exist together than is sometimes imagined.

Tubercles or *tubercular formations* consist of a greyish semi-transparent caseous, inorganic substance, and in their smallest size are not larger than a millet seed; but by agglomeration often produce much larger masses. In time, they become softened, and this change is followed by suppuration. As they are often extensively disseminated in the lungs, they destroy the original texture of these organs, which become disqualified for the efficient performance of respiration. The matter formed in the situation of tubercles, termed vomicæ, making its way into the ramifications of the bronchi, is coughed up from the trachea, occasionally mixed with blood. Pulmonary phthisis is thus really a scrofulous disease. But the lungs are not the only viscera, in which scrofulous tubercles frequently occur, for they are met with in the spleen, peritoneum, intestines, brain, and liver.

Tubercles, as I have already stated, are at present mostly regarded as effects of scrofula, and though Dr. Abercrombie detected some differences between the constituent parts of scrofulous glands and pulmonary tubercles, Professor Carswell tells us, in his Illustrations of the Elementary Forms of Disease, that he detected the tubercular deposit in abundance both in lymphatic glands, and in those of the mesentery, when the seat of scrofulous disease. It may exist in the tissues in an infiltrated state, as in the bones and around the joints; and although the character of the affection does not change, the name of the tubercle is here no longer assigned to it.*

The lymphatic glands are frequently attacked by scrofula in a secondary way. Thus, in children afflicted with porrigo, the glands under the ear and lower jaw after a time inflame, and, if the constitution be scrofulous, they will become the seat of strumous disease. They may also swell from the irritation of catarrh and sore throat. When the glands of the mesentery become diseased, it is often in consequence of a diseased state of the mucous membrane of the bowels. The glands in the groin and armpit frequently swell, as the consequence of disease in the adjoining limb, and where a tendency to scrofula prevails, such swelling will be so influenced by this condition of the system, as to become a tedious scrofulous abscess or ulcer.

That some peculiarity of constitution, original or acquired, must be a *predisposing cause of scrofula*, is now generally acknowledged, difficult as it is to define precisely what the nature of such peculiarity may be. According to some pathologists, there is an undue preponderance of the white over the red tissues, or, as Portal supposed, a deficiency of red blood in relation to the great quantity of colorless fluids in the vessels. Baudeloqu ascribed the disease to some imperfection in the original preparation of the blood; Borden to derangement in the nutrition of the different textures of the body. An individual, originally free from a scrofulous diathesis, but afterwards exposed to certain noxious influences, may become the subject of scrofula; indeed, under certain circumstances, scrofula may perhaps affect any kind of constitution.

---

* Eager in Dubl. Journ. of Med. Science, vol. v. p. 345.

What is called a *scrofulous constitution*, is not invariably accompanied by the same appearances. Some individuals have a pallid countenance, a deficient proportion of vessels filled with red blood, and a redundance of white tissues, the abdomen is tumid, the muscles are loose and flabby, the circulation is languid, and there is a want of vigor both in the mind and body. Other subjects of scrofulous diathesis have a great deal of color, an accelerated circulation, and a precocious development of the mental and corporeal powers. In such persons, it cannot be said, that there is any deficiency of vessels containing red blood. With regard to the scrofulous diathesis, which often seems to be congenital, though it may undoubtedly be acquired after birth from the influence of various detrimental circumstances on the system, it appears to be referrible to the fact adverted to by Mr. Lawrence, that each individual has something peculiar to himself in his bodily organisation; that there are infinite varieties of natural organisations in the human species, and that, in individuals, distinguished by some of them, there is a greater or less susceptibility of particular forms of disease. This view would not, however, lead me to doubt the fact, that a constitution, originally perfect, may be so changed by various influences as to become at a subsequent period prone to scrofulous disease. Still those constitutions, which are congenitally disposed to scrofula, will have the disease brought into action by causes which will not invariably excite it in other temperaments. Amongst the *exciting causes of scrofula* are usually specified various circumstances tending to produce debility, or, at all events, to leave the system in a seriously disordered state, as fevers from contagions of a specific kind, like measles, scarlet fever, and small-pox. Hence, previously to the introduction of vaccination, scrofula prevailed even to a greater extent than at the present time.

Of late years, scrofula, and many other diseases, have been ascribed to disorder of the digestive functions, little trouble being taken to consider fairly whether such disorder may not be rather the common effect, or accompaniment of such diseases, than the cause of them. To say that, in scrofula, there is always more or less disorder of digestion, and primarily of no other important function, is an hypothesis that cannot be reconciled with the fact of the occasional existence of scrofulous disease in the fœtus. Impure air, unwholesome deit, unhealthy employments, uncleanliness, and exposure to a damp cold atmosphere, are undoubtedly frequent exciting causes of scrofula, and sometimes communicate a disposition to the disease, even where none originally prevailed. Yet these noxious influences will operate to this extent only in a limited proportion of individuals; for we find, that in a given number of children, all living together under the same roof, breathing the same atmosphere, feeding and sleeping together, and clothed exactly alike, only two or three become scrofulous. Here then we must return to predisposition, and original kind of constitution, organisation, or susceptibility, as an explanation of the difference.

Of all the exciting causes of scrofula, the operation of climate is the most powerful; for scrofula prevails in the greatest degree in countries which are remarkable for their damp, cold, and variable atmosphere. Individuals, living in warm regions, are more rarely affected; but no sooner do they come to a damp cold changeable climate, than they are even more liable to scrofula than other persons. This is exemplified in the great frequency with which children, brought from the East and West Indies to this country, suffer from the disease. The same thing is also seen in the African Blacks, and the natives of the South Sea Islands, many of whom are destroyed by tubercular phthisis. The monkey also, a native of warm regions, is in the same case.

Notwithstanding the general truth of the preceding statements, respecting the comparative rarity of scrofula in hot, and also, I believe, in extremely cold countries, it is certain that the disease, and this even in its worst or tubercular form, is a source of considerable mortality in Italy, Spain, Minorca, Malta, and several other countries, whose shores are washed by the Mediterranean Sea.

It is probably in consequence of the influence of damp and cold in promoting scrofula, that patients generally suffer more from it in one season of the year than another; their complaints being worse in winter and spring, and better in the mild dry weather of summer and autumn.

Besides atmospheric influence, various other influences deserve to be regarded as promoting the occurrence of scrofula, especially where the organisation of the individual renders him, as it were, predisposed to the disease, and he is residing in a climate favorable to its origin. Improper or insufficient diet, neglect of regular exercise, bad nursing, insufficient clothing, inattention to cleanliness, and the residence of children in badly ventilated crowded dwellings. Hence the frequency of scrofula amongst children who work for many hours daily, crowded together in the unwholesome atmosphere of cotton factories, often badly fed, and, at all events, deprived of that beneficial influence, which due exercise in the open air would have upon their digestive, cutaneous, nervous, sanguiferous, and muscular systems. Period of life has considerable influence, not only in facilitating the attack of scrofula, or in making the individual less susceptible of the disease, but in determining the organs and textures in which it will be most likely to take place, if it is to come on. The period of life, between the termination of suckling and the arrival of puberty, is that in which the greatest tendency to scrofula prevails. In many individuals, as Mr. Lawrence observes, the whole of this period is occupied by a succession of attacks of scrofulous disease in the absorbent glands, the skin, and the joints, and very often it exists in several of these parts at one and the same time. In individuals who have had scrofula in these various shapes, extending over the whole of the body, and who have been for several years the subjects of the most serious forms of disease up to the time of puberty, it is by no means uncommon to find the attacks then decline, and such persons to become healthy and vigorous. At the same time, however, that this particular change takes place, and the succession of disease in the eyes, glands, ears, joints, and skin, is stopped, it not uncommonly happens, that the disease is developed in other more important parts, as the lungs, the mammary gland, or the testicle. Sex also makes some difference; for, according to a calculation of M. Louis, the proportion of scrofulous males to females is only as seventy to ninety-two, or according to the estimate of Lepelletier, as three to five. This fact is ascribed by M. Jolly, Dr. Stokes, &c. to the greater abundance of white tissues in the latter than the former.

Scrofula is not contagious. Kortum, Pinel, Alibert, Dupuytren, Lepelletier, and others, tried in vain to communicate the disease, either by making healthy children sleep with scrofulous ones, or rubbing the skin of a healthy child with scrofulous matter, or by inserting it under the cuticle, or introducing it into the veins or stomach. With respect to the power of a scrofulous nurse to impart scrofula to the child at her breast, it is sometimes suspected that, as her milk is imperfect, and not well adapted to nutrition, she may communicate to such child a predisposition to the disease; but the notion of her doing this by the action of any contagious principle or virus, is now universally rejected. Even the suspicion adverted to is far from being unequivocally well founded.

According to M. Lepelletier, privation of solar light has considerable influence in giving tendency to scrofula; but, though it certainly occasions a pale complexion, a flaxidity of fibre, and a general bloated appearance, these changes may not amount exactly to the state implied by the term scrofula. Independently of the redundance of white tissues and fluids, conjectured to form one of the chief attributes of a scrofulous constitution, and at the same time one of the chief anatomical characters of scrofula, there is no doubt that the composition of the fluids of scrofulous individuals is more or less altered; especially that some of them contain an extraordinary proportion of the phosphate and carbonate of lime and the chloruret of soda; and that these same principles enter copiously into scrofulous tubercles. M. Labillardiere, a chemist at the Veterinary School of Alfort, has ascertained that the milk of a cow, affected with tubercles, contains seven times as much phosphate of lime as the milk of a healthy cow.

The vascular system of scrofulous persons appears by Dr. Macartney to be weak, the vessels small, the blood deficient in quantity, and not possessing the full power of generating coagulating lymph. The secretions, which indicate strength, seem to him to be deficient; the fat of the soft parts, and the marrow of the bones to want the genuine oily composition; the earth of the bones not to be formed in proper quantity; the unctuous secretions of the skin to be deficient; the sebaceous secretion to be albuminous and inodorous, and liable to dry and produce irritation of the parts it ought to protect. The mucous and serous secretions appear to Dr. Macartney to be the only ones perfectly formed; and he describes the brain as pale, and not having the usual quantity of red blood.*

TREATMENT OF SCROFULA.

On this subject I shall here make only a few general observations, because the practice, applicable to particular forms of disease, is more conveniently considered in other parts of this work.

A scrofulous constitution will generally derive infinitely greater benefit from regimen, diet, pure air, proper exercise, &c. than from medicines, which are not, however, to be neglected. The cure of some forms of scrofula will mainly depend on improvement of the system at large, as may be said to be the case with scrofulous ulcers. But there are other examples, in which the local treatment is more efficacious than the internal; and such is scrofulous disease of the bones and joints, as well as one variety of lupus, a tubercular affection of the skin of the nose, now frequently regarded as scrofulous.

When we remember the circumstances which operate as exciting causes of scrofula, we must immediately see, that one of the chief means of obviating that morbid condition of the system, which accompanies scrofula, is the removal of the patient from the reach of various detrimental influences. If he be residing in a damp, cold, badly ventilated, crowded place, he should be immediately taken from it. If his diet be faulty in point either of quality or quantity, it should be rectified. If his clothing be insufficient to protect him effectually from the influence of damp and of sudden changes of the atmosphere, it should be made warmer. If the patient be a child, kept in a sedentary state, working in some crowded factory for a great part of the twenty-four hours, it should be taken from such employ and place, and allowed to have the benefit of a salubrious air and healthy exercise.

---

* On Inflammation, p. 82.

The doctrines of the late Mr. Abernethy make the principal indication in the treatment of scrofula to consist in the improvement of the state of the digestive functions. While I do not admit the truth of the theory, that the origin of scrofula is essentially dependent on disorder of the digestive organs, I fully concur in the advice, that we should always endeavor to restore the natural and healthy functions of those important viscera when in any respect deranged. This indication, in fact, has not been neglected by practitioners who lived half a century ago. Whoever compares the practice of Mr. Charles White, in giving small doses of calomel, occasional purgatives, and the simple or compound decoction of sarsaparilla, with the blue pill, sarsaparilla, and laxative treatment of Mr. Abernethy, will see no very material difference between them, especially when the stress, which White laid upon attention to diet, clothing, the avoidance of damp and cold, and the usefulness of good air and regular exercise, is taken into the account. Mr. Abernethy's practice consisted in giving five grains of the blue pill every night, half a pint of the compound decoction of sarsaparilla twice a day, and, if the bowels did not act by a certain hour every day, some aperient medicine was administered. The plan was followed up until the bowels became regular; and then, with the view of preventing a relapse, five grains of the compound calomel pill were given every night for an indefinite time. When acidity prevailed, small doses of the carbonate of soda were prescribed; and when the stomach was weak and the appetite bad, bark, steel, and the mineral acids were recommended.

A light nutritious diet is generally found to agree best with scrofulous patients; but it should not include wine and porter, unless the forms of disease are attended with profuse suppuration and hectic debility. When the tongue is foul, the breath bad, and the belly tumid, it is advisable to let the treatment commence with brisk purgatives, as jalap and scammony, or the compound powder of scammony, or the antimonial powder and calomel. Such medicines may be given in proper doses at night, and their operation promoted by giving the senna mixture, or castor oil, on the following morning.

The bowels having thus been well opened, we may next employ milder medicines of the aperient and alterative kinds, as rhubarb and the subcarbonate of soda, to which a small quantity of mercury with chalk may be added. Then, with such treatment may be combined, after a short time, the employment of tonic medicines, as the infusion of cascarilla, the sulphate of quinine, and other preparations of bark, or the infusion of calumba, with or without the vinum ferri, or we may give either the compound infusion of gentian, with the subcarbonate of soda; or else the compound decoction of sarsaparilla, with the diluted nitric or sulphuric acid. Those who believe in debility, as essentially conducive to the origin of scrofula, place their chief dependence on tonics, and especially bark, quinine, steel medicines, and cold sea-bathing, or the shower bath, and flesh-brush. If the skin be dry, antimonials are used. Mercury has sometimes been decried as decidedly injurious to scrofulus patients; but this is only a prejudice, apparently derived from the notions about debility, or from the fact of scrofula often following a course of mercury, instituted for the cure of syphilis. Mercury in small alterative doses is often beneficial; and, in scrofulous ophthalmy, even the freer use of it one of the best means of removing the opaque matter sometimes effused in the cornea.

The fear of prescribing mercury for scrofulous patients has now, however, nearly subsided; and surgeons frequently order, besides the preparations I have mentioned, the bichloride, one grain of which is dissolved in an ounce of the tincture of bark, and given in the dose of a teaspoonful, three or four times a day. All the foregoing plans are founded upon the aim of improving the health in general, and do not embrace the idea of combating scrofula with any specific. Amongst the medicines, which have attracted celebrity for their supposed *specific virtues* against scrofula, I have to mention conium or hemlock, the chloride of lime, the chloride of barytes, the sesquicarbonate of soda, and preparations of iodine. As for hemlock, it has now lost the reputation of being a specific, though sometimes prescribed in equal proportion with the compound calomel pill as an useful alterative. The chlorides of lime and barytes, I believe, are completely out of favor. The sesquicarbonate of soda is undoubtedly a useful medicine; but not entitled to be regarded as possessing any specific power over the disease. It is often joined with rhubarb and a few grains of hydrargyrum cum creta, or with rhubarb and cascarilla; which formulæ are sometimes beneficial as alterative medicines, but nothing more. With respect to iodine, it is at present in considerable repute, and as prescribed by Dr. Lugol for internal use, in small doses, varying from half a grain to two grains in the twenty-four hours, dissolved in distilled water, with double its proportion of iodide of potassium, seems to possess considerable power over some forms of scrofula. Dr. Lugol also employs iodine in baths and lotions to a much greater extent than is done in this country. His baths contain about two grains of iodine in each pint of water, and his lotions for ulcers, &c. about one grain and a half, dissolved with iodide of potassium.

OF THE VENEREAL DISEASE.

LUES VENEREA—SYPHILIS.

By the "venereal disease" are usually signified certain morbid changes, produced in various textures of the human body by the action of a specific morbid poison. Some writers, however, extend the meaning of the expression further; for they make it comprehend not only *syphilis* or the *true venereal disease*, but also clap, or *gonorrhœa*, sores of different descriptions on the genitals and numerous effects or accompaniments of the latter complaints. Such writers do not speak of the *venereal disease* in the singular, but in the plural number, and offer a description not of one disorder, but of several, under the appellation of *venereal diseases*, the varieties of which are sometimes ascribed to the existence of different kinds of venereal poison, each capable of producing distinct and peculiar effects on the part and constitution.

Now, if it be inquired what we know about any venereal poison, and what proof we have of its existence, the answer is, that it has never been detected in a separate form, and nothing is known respecting its appearance, color, consistence, or any of its general or chemical qualities. Venereal pus, considered in all its relations, may present globules more or less similar to those of other kinds of pus; it may, according to situation, be mixed with other secretions, norman or morbid, especially with mucus; but its most distinguishing property is that of being capable of inoculation, the results of which are characteristic and specific.* The only further explanation that can be given of it, is perhaps what Mr. Lawrence has suggested, namely, that it is that state of the secretion of a sore, which renders it capable of producing the disease in another person, or that state of the blood in the mother which renders it capable of communicating the disease to the *fœtus in utero;* but what that particular state is we are unable to describe; we are only able to observe its effects, and judge from them that a virus or poison is concerned.

A chancre, or primary venereal sore, produces pus of the specific kind, however only in a certain stage of it; and, as M. Ricord believes, it is from inattention to this simple fact, that the results of inoculation with the matter of venereal sores have been disputed or involved in uncertainty. It it plain that a primary syphilitic ulcer cannot be the same in all its stages, and that it could never heal up, did it not at length change into a simple sore. If we are to believe M. Ricord, it is during the progress or the stationary state of a chancre, while no work of cicatrisation is going on in it, that it secretes the venereal virus, which is not at all dependent upon the greater or lesser degree of inflammation accompanying the chancre.* On the other hand, Dr. Wallace inferred, that a bubo was rarely or never formed, *i. e.* the poison was never absorbed so as to affect the glands in the groin, until some part of the ulcer had produced granulations, by which such absorption was effected. If this view be correct, and the granulating process be a part of the work of cicatrisation, the two foregoing doctrines are at varience with one another; but I am not sure that M. Ricord extends his meaning to the stage of granulation, for a chancre that has granulated may become stationary.

---

* See Ph. Ricord, Traité Pratique des Maladies Veneriennes, p. 55. 8vo. Paris, 1836.

It would not appear to be the nature of the venereal poison always and inevitably to excite inflammation, ulceration, or disease of the part to which it is applied in any shape; it cannot therefore be a very active and quickly penetrating agent; and though the proportion of cases, in which the poison takes effect, is considerable, experience proves, that many individuals, exposing themselves to the risk, come off with impunity. When the contrary happens, the poison, after the expiration of a variable space of time, which appears to be requisite for it to make an impression, produces changes, not only in the part to which it is immediately applied, but, at a subsequent period, in a given number of examples, disease in other situations, in consequence of its absorption into the system.

Syphilis cannot be propagated from individual to individual through the medium of the breath, nor of the atmosphere, nor apparently through the medium of any of the ordinary natural secretions, and certainly never by one person merely touching the sound part of the skin of another individual laboring under the disorder, as was at one time believed.† With the exception of what may happen between a syphilitic pregnant female and the child in her womb, only one way is positively known in which the disease can be communicated, and that is through the medium of the specific poison, blended at the time of its application with pus, or some other morbid secretion. Such infectious matter begins its action by exciting inflammation, followed by a pimple, or pustule, which is gradually converted into an ulcer. Of course, such ulcer is almost always on the parts of generation; but, if a person accidentally prick himself with a lancet infected with venereal matter, or if such matter happen to come in contact with any abraded part of the skin, syphilis may then commence in other situations.

---

* Op. cit p. 85.

† While such doctrines prevailed, medical writers did not deem it at all indelicate to publish the venereal cases, met with in virtuous princes, holy abbots, and pious prelates. See Ph. Ricord, op cit. p. 94.

The symptoms or effects of the venereal disease are divided into the *primary* and *secondary*. The primary are those which arise from the direct application of the poison to the part, namely, *ulceration* of that part, often followed by a *swelling of the absorbent glands*, to which the lymphatics of the ulcerated texture first direct their course; the sore receiving the name of *chancre*, and the glandular swelling that of *bubo*. The latter is deemed one of the primary effects, because excited not really by the poison after its entrance into the circulation (as all the secondary symptoms are believed to be), but by its directly irritating the gland or glands, as it is passing through this portion of the absorbent system into the blood.

The application of the poison does not invariably cause a chancre. It seems as if some individuals were less susceptible of the venereal disease than others, and, no doubt, those who are attentive to ablution, after a suspicious connexion, much oftener avoid being infected, than other parties who neglect this precaution. Nor does the poison, when it gives rise to a primary ulcer, or chancre, constantly lead to the formation of a bubo. I may say, that in the majority of cases, the latter swelling is not produced, and this sometimes even when secondary symptoms follow, and the poison has found its way into the constitution.

The *secondary symptoms* are all those effects of the disease which take place from the introduction of the poison into the circulation, whether ulceration of the throat, cutaneous eruptions, ulcers, or excrescences on the surface of the body, inflammation of the iris, various affections of the nose, ears, testicles, larynx, or joints; and, in the osseous system, severe pains, nodes, caries, or necrosis. These secondary symptoms, which make the *constitutional form of the disease*, do not occur, however, with any regularity. In many cases, they never show themselves at all; while in others, they take place with great severity, though there may be no remarkable differences in the appearance of the primary ulcers, or the kind of treatment, to account for this diversity of consequences. In a given number of cases of primary symptoms, under any plan of treatment, secondary symptoms will occur only in a limited proportion of the patients.

M. Ricord, by means of inoculations with venereal matter, practised repeatedly and extensively, has the merit of having, perhaps, settled some points, relative to syphilis, which have until lately been a source of endless dispute. Amongst other things, his experiments prove, that the cessation or the continuance of the primary complaint, whatever may be the period of its duration, does not make the patient incapable of contracting others; and his investigations, verified by Fricke, Lallemand, Ruef, and Blandin, fully establish the doctrine, originally promulgated by Hunter, that the number of secondary symptoms is not at all in relation to that of the primary ones; and that no more constitutional effects will follow two, three, four, or five chancres *contracted at the same time*, than if there were only one chancre.*

In this work, I shall not dwell upon the facts and arguments against the opinion, that the venereal disease began in Europe towards the close of the fifteenth century, having been either brought to this quarter of the world from St. Domingo by the followers of Columbus, or having broken out from unknown causes in the French army then besieging Naples. Every consideration that I have been able to give to the subject leads me to believe, that the venereal disease has existed from time immemorial; that it always has existed, and always will exist in every populous country, where promiscuous sexual intercourse takes place. Those, who ascribe the origin of syphilis to the latter part of the fifteenth century, are much influenced by one fact, which is, that down to that period no description of any disease, corresponding exactly to what we call syphilis, had been given by medical writers; and although ulcerations on the genitals, and buboes, had been commonly treated of, no mention was made of the secondary symptoms, no connexion was ever traced, or even suspected, between the primary effects, as they are called, and the sore throat, cutaneous affections, and the pain and swellings of the bones, which we denominate secondary ones. Perhaps, however, it is scarcely allowable to infer, that because no notice is taken of the secondary symptoms of the venereal disease in the old works on medicine and surgery, that such complaints were not in existence previously to the close of the fifteenth century. The relation of the primary and secondary symptoms to one another might have been overlooked; it might never have been suspected when there had been a chancre on the penis, that the sore throat, cutaneous affection, or node, which came on subsequently, had any connexion with the sore. Certainly this will not seem incredible when it is recollected, that it was not until a recent date that some particular effects of the venereal disease were made out; and that, even at the present day, with all the advantages of a better system of pathology, our knowledge of many circumstances, relative to this extraordinary disease, is very obscure and uncertain. Thus, two or three hundred years hence, when it shall be recorded to posterity, that, at as late a period as the year 1800, no account had been given of syphilitic iritis, and that the true character of gonorrhœal ophthalmia had not been described, I think it would not be correct to infer, that those affections had no existence until the time when they began to be discussed in works on surgery. Their not having prevailed, and their not having been described, are two different things.

---

* Ricord, op. cit. p. 84.

Not only are diseases of the genitals acknowledged to have existed from time immemorial, but we have every ground for believing, that they were of a contagious nature. This seems proved by the precautions adopted by various governments, to prevent the extension of such disorders among the population. Thus, in the borough of Southwark, prior to the time sometimes fixed upon for the origin of syphilis, there were places called *stews*, where prostitutes were confined, and received the benefit of surgical assistance. They were taken up and put into these establishments, whether agreeable to them or not, by virtue of certain decrees, made expressly to protect the rest of the community from the risk of catching their complaints. At the same time or even earlier, similar establishments were formed in Paris, Edinburgh, Avignon, and even in the holy city of Rome, under the Pope's nose, under the walls of the Vatican itself, with an abbess at the head of it.

In relation to the origin of syphilis, one interesting question presents itself, namely, are we to fancy that the disease never had but one primary source? and that it is to the mysterious concoction of the specific virus by one couple of individuals, that all quarters of the world, and all generations, are under obligation for the gift of the venereal disease. No doubt, syphilis must have had a beginning, like every thing else; but probably it has had numerous beginnings. Various considerations would lead us to expect, (what is indeed the fact), that in every country where the population is numerous, and promiscuous sexual intercourse exists, the venereal disease would be prevalent. Mr. Travers expresses his conviction, that if all the syphilis in the world were now to be annihilated, a never-failing source of the disease would still remain in the action of the matter of superficial or gonorrhœal ulcers of the penis on the human constitution. If I have a correct comprehension of this gentleman's views, however, he looks upon the poison of syphilis and that of gonorrhœa as identical, and the suggestion which I have quoted from his interesting remarks on the pathology of the venereal disease, perhaps, necessarily involves that conclusion; but this is a disputed point, and a greater number of professional men do not now take the same view of it as John Hunter did. The experiments of M. Ricord are asserted, indeed, to furnish complete and ocular proof, that whenever inoculation with what is called *gonorrhœal matter* communicates the venereal disease, chancres exist in the passage, which is the source of the matter of the supposed gonorrhœa. Some persons, as Dr. Macartney notices, are subject to inflammation of the glans penis and prepuce, after copulation with healthy women. Sometimes a female will suffer after marriage an extensive inflammation of the internal labia and vagina, attended with a purulent discharge, although no venereal disease has been communicated. Dr. Macartney conceives it possible, that the transmission of pus, generated in this way, and mixed with other secretions, might have given origin to the true venereal inflammation.*

I have explained, that the venereal disease is commonly believed to be communicable only through the medium of pus. The late Mr. Hey, of Leeds, was induced, however, to regard this doctrine as incorrect; and, from some cases which came under his observation, he suspected that the disease might sometimes be communicated, not only after all ulceration and suppuration had ceased, but even when the person giving it to another was to all appearance in perfect health; but whoever reads the cases, on which Mr. Hey founded this extraordinary inference, will perceive how great was the possibility of his being deceived by the patients, who gave him the histories of their cases. Some particulars involved the honor of the individuals themselves, and therefore they might have been ashamed of disclosing every secret relative to their cases. It is more rational, I think, to suppose that Mr. Hey had been deceived by the patients themselves, than that any such mysterious sources of infection existed, as those implied by his view of their cases. The idea that syphilis can be communicated by a person so healthy, that he has no venereal matter formed upon any part of the surface of his body, or indeed any visible or palpable complaint whatsoever, is a problem, that every thing yet ascertained about the nature of syphilis tends to refute. As the venereal disease may be transmitted from the mother to the fœtus through the medium of her blood, many surgeons have been inclined to suspect that it may be also communicated through the medium of the natural secretions, such as the saliva, the semen, the milk, &c. With respect to the fœtus we may infer, that it receives the infection by means of the circulating blood, in the same manner as the mother herself receives her secondary symptoms; but with regard to the saliva, semen, and milk there is no clear evidence that these natural secretions will serve for the transmission of the disease. I believe with Mr. Travers, that none of the common natural secretions of a contaminated individual can communicate the disease to other persons. The following statement in this gentleman's work is interesting: a man who has syphilis in the secondary form, provided he be free from all affections of the genitals, will communicate no taint to his progeny, any more than to his wife; but a healthy wet nurse, getting a sore nipple in consequence of suckling a pocky child, and having secondary symptoms, will communicate the disease to the fœtus with which she may become pregnant. Now this is agreeable to the usually received opinions, that the blood will contaminate the embryo, though all genital sores may be absent, and though the party cohabiting with the woman, is beyond the sphere of the influence of the disease in her. So far, then, as the present state of our knowledge reaches, we may conclude, that the disease is only communicable through the medium of purulent fluid, and not an ordinary natural secretion, with the exception of the mode of its transmission to the fœtus, which receives the infection through the circulation, and may be regarded as under the same circumstances, with respect to the secondary effects of the disorder, as the mother herself. There may also be an exception to the general principle in what happens between the pocky child and its nurse, provided the disease in the former is to be regarded as the constitutional modification of it, transmitted through the blood of the mother.*

---

* See Macartney on Inflammation, p. 108.

The effects of the venereal disease are different in different individuals; two men may have connexion with the same woman; both may catch the disease, but one will have it severely, and the other only in a slight and mild form. One man has been known to give the disease to different women; some of whom have had it in a lenient shape, while the others have suffered most severely. Sometimes the same individual will have two or more sores of different kinds at the same time. In some examples, sores of the Hunterian character are seen on the glans penis, while sores of other descriptions are close by them. One of the most curious circumstances in the venereal disease is not unfrequently exemplified in the army: soldiers are sometimes gregarious in their armors: a party of six or eight will have connexion one after another with the same woman. In this manner, several men contract disease from the same source, and on one and the same occasion; yet they do not all suffer in the same manner. Some have sores of one kind; some of another; and some, various sorts of ulcers; while others will contract a discharge from the urethra. That discharge, however, according to the experiments of M. Ricord, if capable of communicating a chancre by inoculation, has always for its source venereal ulceration in the part from which it proceeds. It is not, some however, every gonorrhœa, or discharge from the urethra that has this property.

"Ever since I have employed the *speculum* uteri in the investigation of venereal complaints (says M. Ricord), many perplexities about them, previously inexplicable, have been reduced to the most ordinary and simple facts. With this instrument I have ascertained that a woman may be simultaneously affected with blennorrhagia and deep-seated chancres in the vagina and uterus, so that, though considered only to be laboring under blennorrhagia, she might well communicate chancres and blennorrhagia together, or merely one of these affections." M. Ricord further declares, as the result of numerous observations, that whenever he has had the opportunity of examining women who had communicated disease, he had never found that a chancre had originated from a discharge, unattended with ulceration in the genital organs of the female from whom the complaint was contracted. Inoculation afterwards confirmed what the observations made with the speculum had established. It is not, however, according to M. Ricord, every state of ulceration in the vagina or womb, keeping up a discharge, that will admit of a chancre being produced by inoculation with such discharge; for, if it be in the granulating stage, it is no longer adapted to this purpose. On this point, however, M. Ricord leaves us in some difficulty; for, in another part of his work (p. 137.) he admits, that what he terms the *specific ulcerative period* is indefinite, and that he has inoculated with pus derived from sores of eighteen months' continuance.

---

* Certain descriptions would tend to prove, however, that the ordinary secretions of the female organs are sometimes the medium or vehicle of infection. M. Ricord joins in the belief, that the disease may be communicated through the medium of common secretions, mucus, milk, &c. "If," says he, "the mouth of a child may infect its nurse, the breast of the nurse may infect the child." Op. cit. p. 95.

Supposing it to be clearly proved, continues M. Ricord, that "the muco-purulent secretion, taken from the female genital organs, can never produce a chancre, when the speculum demonstrates that no ulcerations of this nature exist in those parts, it is allowable by the most rigorous analogy and the closest logic to conclude, as I have done, that whenever a discharge from the male urethra has communicated a chancre to a woman, there must have been something more than gonorrhœa about the man, and the urethra, at some point of its extent, must have been the seat of a chancre."

As for the Hunterian hypothesis, which supposes the cause of gonorrhœa and syphilis to be identical, and the difference of effect to depend upon the textures affected, the poison when applied to a non-secreting surface being supposed to give rise to chancre, and applied to a mucous one being fancied to occasion gonorrhœa, M. Ricord argues, that, if this were true, the muco-purulent discharge from the urethra ought, when put on the skin, to cause a chancre; and the pus of a chancre, applied to mucous membranes, ought to cause gonorrhœa. But M. Ricord asserts it as a well-known fact, that gonorrhœal matter never produces chancre on the skin, and that when it is applied to any mucous membrane, and has effect, it gives rise only to a discharge. He further observes, that the matter from the urethra, applied to the mucous membrane of the eye, has never caused chancres in that texture, or the eyelids; *nor*, on the other hand, says he, has *the muco-purulent secretion of gonorrhœal ophthalmia ever given rise to chancres by inoculation, or otherwise*, although the eyelids are capable of being the seat of such ulcers. When a bubo has originated from gonorrhœa, and suppurated, M. Ricord has constantly found, that no disease can be imparted by inoculation with the matter. The same fact he has repeatedly made out in relation of the matter of abscesses, now and then following inflammation of the testicle from clap.

Many of the circumstances, which have been noticed, are adverse to the opinion, that syphilis is owing to a pleurality of poisons; for here are many different effects, apparently produced from the same source. Facts of this nature, however, create considerable difficulty in the investigation of syphilis,—a difficulty that cannot be solved by reference to peculiarities of constitution or states of health; for certainly no explanation on these principles will account for two or three different kinds of sores occurring in the same individual on the same part, and all at the same time. Neither can the circumstances be ascribed to the differences of texture between the prepuce, glands, and corona glandis. No doubt, the kind of texture often modifies the appearances of sores; but this will not explain the peculiarities I have mentioned, because sores of different kinds are met with in one and the same texture; as, for instance, on the prepuce, or on other parts of the skin of the penis. The researches and experiments of M. Ricord, however, if established beyond all doubt, would throw considerable light on some points here noticed. I would also remark, that before any inference can be drawn from the circumstances mentioned with respect to profligate soldiers, a minute investigation into their cases would be essential; for it is hardly to be credited, that such individuals would not be in the custom of cohabiting with a great number of women in a short space of time, and not merely with the one who received them in a gregarious way.

That the effects of the venereal disease are modified by climate, mode of life, and state of the general health, is universally acknowledged. Hence syphilitic affections get well with greater facility in warm climates, and the symptoms are much milder than in cold countries. The observations, made by Dr. Ferguson on the venereal disease in Portugal and the West Indies, leaves no doubt on these points. When the British army was in Portugal, our soldiers suffered severely from this disease; yet the natives, from whom they caught it, had it in an exceedingly mild form; so that, while amongst our troops it made terrible ravages, occasioning in many of them the worst of mutilations, the natives suffered but very slightly, and got well under what would here be regarded as inert treatment. Attempts have indeed been made to explain these facts by the greater excesses which our solders were guilty of, and their habit of drinking more spirits and wine than the Portuguese; and no doubt, these circumstances must have had some share in rendering the disease worse in them, than in the more abstemious natives. Another question is, whether the greater mildness of the symptoms of the venereal disease in warm than in other countries, is to be ascribed to any modifications or changes in the nature of the poison, produced by the temperature or atmospheric causes? I think what has been stated will refute this notion; for it appears that in Portugal the British soldiers suffered severely from the disease; consequently, the virus must have possessed sufficient activity, provided the ravages alluded to were truly occasioned by the operation of the virus, and not by phagedenic diseases independent of such a cause. Another question is, whether the greater mildness of the disease in warm countries is owing to the effects of the atmosphere in rendering the individual less susceptible of the influence of the disease; or whether it maintains the system in such a state as makes the disease yield more readily to the remedies employed. All these points are still disputed ones. The opinion, that the disease is continually getting milder and milder, and will in the end cease altogether, has been entertained almost from the earliest periods; at all events, nearly from the time of its supposed origin, towards the close of the fifteenth century; but, instead of adopting this conjecture, a more rational way of explaining its greater mildness at the present day will naturally suggest itself to every man of judgment and reflection; viz., by the consideration of its treatment being now conducted with much greater skill and discrimination, than it was forty or fifty years ago. Many, who incline to the opinion that the disease originated towards the close of the fifteenth century, lean also to the belief, that the disease is continually changing its nature, and becoming milder; for if they did not shape their conclusions in this manner, they would be obliged to renounce the other doctrine, respecting the time of the first origin of syphilis: because the veneral disease of the present time is totally different from the rapidly fatal and infectious disorder which broke out in the French army before Naples. As a matter of course, therefore, they must think, that syphilis has changed its nature, and assumed milder forms. Within my recollection, the disease was more severe than it is now; but the cause ofthis fact I should account for on a different principle; in fact, when I was a student at St. Bartholomew's Hospital, the treatment of this disease was what would now be considered injurious in the extreme, for it consisted in the administration of mercury in the most unmerciful and indiscriminate manner. The practice in those days was founded indeed on a doctrine now exploded, viz., that it is the invariable character of syphilis to proceed from bad to worse, unless checked by the power of mercury. This was undoubtedly a most pernicious error—one that led to the death of many unfortunate persons. When Mr. Abernethy was making investigations into the nature of the venereal disease, he went to all the most experienced hospital surgeons in London, and put these questions to them—whether the venereal disease is capable of spontaneous cure, and whether the primary symptoms can be removed and the disease be permanently cured without the aid of mercury? and from all these men of eminence he received the answer, that a spontaneous cure, or even one without mercury, was totally impossible. In those days, then the opinion prevailed universally, that the disease would be sure to extend itself, and could not possibly admit of a salutary change, unless the patient were put under the influence of mercury. However, in the year 1813, in one of the early editions of this work, I happened to take into consideration some observations, inserted by the late Mr. Pearson in his Treatise on the effects of certain Articles of the Materia Medica in the cure of Lues Venerea, and from which it clearly appeared to me, that what he stated was absolutely equivalent to an admission, that syphilis would sometimes, at least, get well under the administration of the most inert medicines. Although this gentleman, whose experience at the Lock Hospital was unbounded, may be said to have added the weight of his authority to the maintenance of all the principal Hunterian doctrines relative to syphilis, any impartial man who studied his book could not fail to discern the clear admission in it, that a beneficial change was often brought about, in syphilitic cases, without the exhibition of mercury. Since the year 1813, the correctness of the view, which I then took, has been fully confirmed by subsequent experiments and observations. Amongst the investigations to which I allude, those made in the hospital of the Coldstream Guards by the late Mr. Rose are the most important. The great question, as to the spontaneous curability of syphilis, was by him completely settled. It was proved, that the venereal disease might be cured, not only without mercury, but without any medicines whatever. As for the cure without mercury, that indeed may be said not to have been a new discovery: the spontaneous cure was the great point made out. Many practitioners of the sixteenth and seventeenth centuries treated the venereal disease with considerable success without mercury, that is to say, by means of guaiacum, sarsaparilla, and antimony, occasionally aided by venesection and purgatives. If it had been the character of the venereal disease always to grow progressively worse without mercury, no patient could ever have recovered prior to the epoch when that medicine began to be exhibited, which is contradicted by abundant evidence.

Mr. Rose had vast opportunities of bringing the question to a decision; for he could not only put his patients under particular treatment, but he had it in his power to enforce its strict adoption, and to watch his patients for the requisite period of time. Now, he cured without mercury all the ulcers on the parts of generation, sores of every kind, which he met with in the course of between two and three years in a regiment of soldiers, together with all the constitutional symptoms that followed them. It is not to be understood, that none of those, who were cured of the primary sores without mercury, had no secondary symptoms; a certain proportion of the men, so treated, had them; but, be it noticed, that Mr. Rose cured both the primary and the secondary symptoms too on the same plan.

Some of these cases were probably not truly venereal; yet others must be admitted to have been venereal; for it cannot be imagined, that there were not many cases of true syphilis in a regiment of twelve or fifteen hundred men, who were continually having intercourse with the lowest prostitutes of the metropolis. In the treatment pursued by Mr. Rose, all ideas of specific remedies were renounced; his general practice was to confine the patient in bed; various local applications were used according to circumstances; aperient medicines, antimonials, bark, diluted sulphuric acid, and occasionally sarsaparilla, were administered; these were the chief means resorted to. From these, and other accounts corroborating them, there can be no doubt, that the venereal disease, both in its primary and secondary forms, may be cured without mercury; but this is not settling the question whether such practice is the right method or not? And I have only mentioned the circumstance to prove, that the old notions about the progressive nature of the venereal disease, till stopped by the imaginary specific effects of mercury, were completely erroneous. The facts, established by Mr. Rose, are chiefly valuable on two accounts; first, as leading to more correct views of the diagnosis of the disease, inasmuch as they abolish the false doctrine, that all sores, healed without mercury, are necessarily not venereal, a maxim usually taught when I was a student; and, secondly, Mr. Rose's facts are important, as encouraging us to withhold mercury when the patient's health is not in a safe or favorable state for its exhibition. Thirty or forty years ago, surgeons were actually frightened into the use of mercury, lest the disease should get progressively worse and worse, and the mischief advance till the patient had been destroyed.

The venereal disease presents itself in a great variety of shapes, and is attended by apparently the most capricious irregularities, and this in relation both to the primary and the secondary symptoms: thus, we find, that some persons will have only superficial ulcers without induration around and below them, but with elevated or raised margins; while others will have sores, characterised by a hard circumference, an indurated base, an indisposition to granulate, and, in a word, all the features belonging to, what is called, the Hunterian chancre. Again, others will have phagedenic sores, entirely different from either of the other kinds now described; and while one individual will have only one sore of one of the descriptions here pointed out, another will have not merely a sore, corresponding to one of those varieties, but also a bubo; and a third will have gonorrhœa, in addition to the chancre and bubo. With respect to the secondary symptoms, these also exhibit the most perplexing diversities: the primary symptoms are frequently followed by secondary ones, as varied as the former, and even more so; thus, with regard to the cutaneous eruption, the spots on the skin may either be a scaly eruption, a papular eruption, a pustular eruption, or a tubercular eruption. The sore throat also, which is a common secondary symptom, presents itself in a varity of forms: there may be a deep excavated ulcer on the tonsils, or only a superficial ulceration of them; or there may be an ulceration, extending to the upper part of the pharynx and soft palate, without affecting the tonsils. Then, in the affections of the osseous system, we notice the same indisposition in the disease to confine itself to any determinate shape: there may be only periostitis—a mere swelling or inflammation of the periosteum; or there may be true nodes, or a real enlargement of the osseous texture itself—an increased deposition of bony matter; or there may be merely pains in the bones, or swellings and pains of the joints. Thus, we see in the outline of this singular disease, nothing but variety and irregularity, which it is difficult to solve by reference to any principles yet suggested by the many able men who have exerted their talents in the investigation of this Protean disorder.

Mr. Carmichael attempted to explain some of the varieties of the venereal disease, by supposing a plurality of poisons; by the consideration that it is in truth not one, but several diseases, each depending on a specific poison of its own. His doctrine is, that, except in a few anomalous cases, every primary sore has its corresponding eruption; so that we may foretell by the appearance of the former what the latter will be, provided it come out at all; or if we see only the eruption, we may be able to pronounce from it what has been the character of the primary sore. When these views were first made known, they raised the most lively hopes, that a great step had been made in the knowledge of venereal complaints. But the disease in London is not found to have the same regularity and constancy in the relations between its primary and secondary symptoms, as Mr. Carmichael thought that he had noticed in Dublin. A primary sore of a determinate character will frequently communicate a sore of a different kind, and, what is still more inexplicable, frequently several sores, each of different kinds. Certain facts, recorded by Mr. Evans, prove, that a connexion with a common prostitute, in whom there are no ulcers at all, will sometimes give rise to venereal complaints, and then the disease seems indeed to have been communicated through the medium of the secretions of the genital organs, with which the poison was commixed. So far as the doctrine of Mr. Carmichael goes, which ascribes the origin of phagedenic ulcers to a particular venereal poison, the idea does not seem at all tenable. We have seen that the phagedenic character may occur as a complication of any kind of ulcers, whatever may have been their original nature, and that such unfavorable change often depends on constitutional causes, bad health, injudicious treatment, intemperance, disturbance of the part, and other very definite and manifest circumstances. It is true, that we see in hospital gangrene and phagedenic diseases from syphilis, which are believed to be analogous to, or identical with, hospital gangrene, disorders certainly capable of propagation by contagion; but this refers to the accidental application of the matter, by means of a sponge, &c., to the abraded surface in another person. Without such abrasion there would have been no evil consequences. Then, how unlikely, how impossible I might say, it would be for a person afflicted with a phagedenic disease of the genitals to have sexual intercourse, so as to give the complaint to another person. On the contrary, we have reason to believe, that some of the worst forms of phagedenic ulcers are communicated by women, who have but trivial complaints themselves. Every body has heard of the captivating Lisbon opera dancer, whose charms attracted so many of the officers of the British army into her embraces. If we are to credit the reports, many hundreds of our countrymen had connexion with her, no doubt civil also as well as military; and great numbers of them received, as a reward for their adoration of this irresistible goddess, the present of something more than a trifling clap. Many who had an acquaintance with this lady, contracted venereal complaints of a particularly obstinate and afflicting kind, such as are comprised under what is sometimes facetiously denominated the *black lion*, a phagedenic, rapidly spreading, almost uncontrollable ulceration of the penis, yet this lady continued to dance every night for months and months together, as if she were right in every respect herself, whilst her unfortunate friends were suffering all the pains and penalties inflicted upon them through the power of so fascinating a goddess, whose poison, like that of the serpent, hurt not herself. Now it cannot be imagined that she had phagedenic ulceration of the genitals, while she was discharging her duties so well, which consisted of dancing in the early part of the night, and of another sort of amusement in the latter part of it. It is impossible then to suppose, that these phagedenic sores could have arisen from a particular kind of poison, the product of any phagedenic sore. Mr. Carmichael's description of the venereal disease is excellent, so far as the symptoms are concerned; we daily recognise in practice the very forms and shapes of the disorder which he has described so well; yet we see various circumstances, which prevent us from coming to his conclusion respecting the diversities of venereal diseases. We cannot trace any uniform and mutual correspondence between the primary and the secondary symptoms; for the different effects, which he refers to different poisons, are found by us to be frequently too much blended together. One series of complaints is not to separate, so restricted to particular cases, as Mr. Carmichael's views would induce us to expect; for instance, we often meet with the scaly and pustular eruptions in the same patient. His account of the causes of phagedæna is totally incompatible with the facts revealed to us by experience. No doubt the Lisbon opera dancer had not any thing very serious the matter with her; probably her natural secretions were somewhat changed, or she might have had at most some gleety affection. Then we must recollect another fact, which agrees with my inference from the opera dancer's case; in the large towns in France, it is customary for the Cyprian corps to be inspected once a week by medical officers; this was the established plan when I was abroad. Mr. Evans, who was stationed in Valenciennes, attended several of these reviews, made under the direction of the police. The British garrison at Valenciennes, at that time, consisted of four or five thousand men, and many of them suffered severely from venereal complaints; there was at least the usual number of venereal cases among them : yet Mr. Evans informs us, that in the inspections referred to, where some hundreds of concubines were carefully examined, very little disease was found. M. Ricord, whose researches lead him to recognise only one kind of venereal poison, after noticing the influence of situation and texture, describes the varieties and particular forms of chancre as being developed after, and under the influence of, conditions which have nothing to do with the specific cause; as, for instance, peculiarity of constitution, preceding or concomitant diseases, hygiene, and the general or local treatment pursued. "Hence," he remarks, "we see patients with phagedenic chancres, who have contracted their disease from persons that had apparently only slight sores."*

Mr. Travers suggests one peculiar mode by which the venereal disease may be communicated; he supposes that a woman may, in some instances, be the passive medium of infection, that is, when she has had connexion with an infected person, and immediately afterwards has connexion with another man who is sound, the last person may be contaminated, though she may escape the disease. This seems possible; but whether it frequently happens or not, it is difficult to say. "It is incontestable," says M. Ricord, "that women who have had intercourse with infected men, and who have afterwards cohabited with healthy ones, have infected the latter, though not themselves diseased, but only the vehicle of the infectious matter. Such cases I have had an opportunity of verifying, and if they were not common, might create a belief in the spontaneous origin of the venereal disease amongst healthy persons."† At all events, it appears as if the natural secretions of the female organs were sometimes pregnant with infection, though no ulceration exist in the genitals.

Mercury often facilitates the cure of venereal complaints : this is a truth unequivocally settled; yet, generally speaking, the disease may also be brought to a conclusion without the influence of mercury. In this last sentence are contained the sum and substance of all the valuable inquiries made in modern times, respecting the possibility of dispensing with mercury in the cure of venereal complaints.

---

* Op. cit. p, 186.

† Id. p. 98.

But the question, about the necessity of using mercury, is not settled by our being told, that such medicine is not essentially and absolutely necessary for the cure. The decision for or against its employment must rest on other grounds; and first it should be considered, not only whether the non-mercurial method is the most expeditious mode of cure, but whether it succeeds most effectually in removing the primary symptoms, and also in preventing or curing the secondary ones? This view changes the question altogether. It has been fully proved, that all the primary and secondary symptoms of syphilis may be cured without mercury; but we are to inquire, is this the quickest way of doing it, and does this practice render the secondary symptoms less frequent? When we look over some of the evidence on these points, we might be induced to suppose, that mercury ought not to be given at all; but when the comparatively greater quickness of the cure of the primary eruptions, often exemplified when mercury is not given, is found to be counter-balanced by the comparatively greater frequency of the secondary symptoms, when mercury is not given, our first impressions receive a check. It appears from valuable and important documents deposited in the Army Medical Board Office, that out of 1940 cases of venereal primary sores cured without mercury, the average time required for the cure when buboes did not exist, was only twenty-one days; when there were buboes, forty-five days. On the other hand, when mercury was employed, out of 2827 chancres, treated with that medicine, the average time for a cure when there was no bubo, was thirty-three days, and with a bubo fifty; so that here things are in favor of the non-mercurial treatment, so far as the primary symptoms are concerned, and without reference to secondary ones; and this corresponds with the results of similar investigations made in the venereal hospital at Paris, and which proved that the non-mercurial removed the primary symptoms sooner, than the mercurial treatment. But as we are not compelled to restrict ourselves to either one method or the other, I think that the entire rejection of mercury, even in relation to the treatment of primary symptoms, (and abstractedly in this point of view,) is not rendered justifiable by any views, which have yet been brought before the public. This must be manifest, when it is acknowledged, that a certain number of cases of primary symptoms, cured without mercury (not perhaps a considerable number), are very tedious ones. The calculations I have mentioned were the average of the whole number of cases, throwing out of view cases in which the cure was particularly tedious; therefore with reference to them, a determination to abstain from mercury was, strictly speaking, decidedly wrong. A consideration, which ought to influence us more powerfully, than the slowness or quickness of the cure of the primary symptoms, is the question, whether the secondary symptoms are more frequent after the non mercurial, than after the mercurial treatment. On this interesting point we receive different information from different quarters; one computation makes the proportion of cases, in which secondary symptoms followed the non-mercurial treatment, to be one in three; a second, one in ten; a third, one in twelve; a fourth, one in five; and a fifth, only one in twenty; but the cases of secondary symptoms, where mercury had been given, were only one in fifty-five. This fact, if it were to agree with general experience, would be a most important consideration in favor of the use of mercury. Its power in preventing the secondary symptoms from coming on would then be fully proved to be greater than that of the other plans of treatment here specified (excluding the effects of the salts of iodine, which had not then been tried). It would indeed be proved, that secondary symptoms more frequently come on when mercury is not used, than when it is. But it does not follow from this, as a matter of course, that we are to give mercury. The state of a chancre may be such as to be more likely to be exasperated by mercury, than to be benefited by it. The condition of the patient's health may be a prohibition to its employment. Then a circumstance, that ought to have some weight, is the well-known fact, that when secondary symptoms do follow the non-mercurial treatment, they are for the most part milder, and more easily curable, than those which take place after the use of mercury. All the experience that I have had in the hospital and elsewhere attests this fact. I am not surprised, therefore, that mercury is nearly abandoned, not only in several hospitals on the continent, but, as I am informed, in one of the principal hopitals in the United States.

Whenever mercury is given, the wisest plan is to give it in moderation, and, above all things, to avoid the pernicious custom of putting the patient under a *course*, in which the mercury is given rapidly and profusely, and continued for an immoderate length of time. Experience has fully convinced me, that in no variety of chancre, nor in any other stage of the venereal disease, is it proper to give mercury so unmercifully, and for so long a period as was formerly done. At all events, violent and long salivations should be given up. This practice, as I can state from my own observation in the foul wards of St. Bartholomew's Hospital, during a period of twelve years, instead of being more successful than the present methods, often led to the most dreadful of mutilations, and the number of those who lost their palates and noses, was infinitely greater than what is now observed. I should guess, that for every such instance in the present day, there were then twenty. When these facts are considered, and joined with the treatment employed thirty or forty years ago, we cannot avoid concluding, that a great deal of those ravages must have been produced not by the disease itself, but by the manner of treating it. At present, the practice of subjecting patients to long and immoderate courses of mercury is given up by all experienced and judicious surgeons. Common ulcerations are also more carefully discriminated from venereal ones; and when mercury is given, it is so administered as merely to produce a moderate affection of the gums and salivary glands, and not to occasion a total derangement of the whole economy.

Surgeons are also now no longer blinded by the pernicious fear, that unless mercury be given, the disease will continue to grow worse and worse till the patient is ultimately destroyed. In former days, directly a patient was brought to a hospital, however bad his health might be at the time, it was immediately considered necessary to cram him with mercury. But we are now aware, that the notion by which the old surgeons were terrified into such practice, was a mere ghost, nothing but a bugbear. When the patient's health is seriously impaired, I advise, as a general rule, the postponement of mercury till an amelioration in that respect has taken place. Even those practitioners, who place the greatest reliance on mercury as a specific, and still maintain that it ought to be called so, qualify their assertions by admitting, that it ought not to be given under every condition of the system; they candidly allow, that neither the condition of the parts, nor that of the constitution, is at all times such as will let mercury be given with impunity; they confess that its rash and unscientific employment will aggravate the symptoms; and they specify two cases in which its use is generally erroneous, namely, during excessive weakness of the system, and while the disease is complicated with excessive inflammation. Under these two conditions, the greatest advocates of mercury commonly admit, that its employment should be postponed. But these are not the only states, in which it should usually be prohibited; it should not be given during any great derangement of the system from diarrhœa, or fever, or from what is termed *erythismus*, a peculiar state of constitution, in which the patient labors under excessive irritability, weakness, palpitation of the heart, and other evils from the mercury already given. There are some constitutions, in which this condition is liable also to be induced by a very slight quantity of mercury, and when it is present, the patient may die suddenly on making any trivial exertion.

Although mercury may not be absolutely essential to the cure of the veneral disease, yet so long as it shall continue to be looked upon by many surgeons as a remedy of greater power for the prevention of secondary symptoms, than any other known medicine, with the exception, perhaps, of the salts of iodine, its employment is not likely to be discontinued. It is used either *topically*, that is, as a direct application to sores, nodes, and other affections, or *constitutionally*, being introduced into the system, either through the medium of the stomach or the skin.

Amongst *topical* mercurial preparations, the *black wash* is in very common use for venereal sores, both primary and secondary. It should vary in strength according to circumstances: when I was a student the proportion of the ingredients was a drachm of calomel to a pint of lime water; but now it is frequently made stronger, and sometimes as much as ten or fifteen grains of calomel are put into each ounce of lime water. With regard to the manner of using it: — if the sore or sores are on the outside of the prepuce, a piece of lint is dipped in the lotion and applied to them; but if the sores are under the prepuce, the introduction of lint into that situation would create too much irritation, and the lotion may therefore be occasionally injected under the prepuce with a small syringe. The *yellow wash*, used in the same manner, contains two grains of the bichloride of mercury in each ounce of lime water.

In general, *ointments* are not good applications for primary venereal sores of any description. Now and then the *unguentum hydrargyri nitratis*, blended with the unguentum cetacei, or with zinc ointment, in various proportions, is employed; and, of late, the unguentum hydrargyri iodide, in the proportion of twenty grains of the iodide to one and a half ounce of lard, has been commended as a dressing for inveterate venereal ulcers. I cannot make any report of its real utility from my own experience.

Another manner of using mercury topically is that of *fumigation*. For this purpose, an apparatus is made use of, furnished with an iron heater, and a copper tube, by which the fumes can be conveniently directed to the part affected; and, in order to be able to do this better, we have both a straight tube and a curved one, the latter being particularly convenient for ulcers in the throat. The mercurial fumigating preparation in general use is *cinnabar*, or the *red sulphuret of mercury*, from which, when placed on the heater, a subtile grey powder is sublimed, which, lodging on the sore, is found in many instances to produce a very beneficial effect upon it. I have seen sore throats, chancres, and other ulcerations, which had resisted for weeks and months every plan that could be devised, assume a healthy appearance, and heal up rapidly, after fumigation had been tried a few times. To know this truth is important; much more so than to be able to say exactly, how far the specific power of mercury was here concerned in the production of the good. The fumigation of a sore of moderate size is not likely to have much or any effect on the constitution; and I should suppose, that the method cannot generally operate on this principle. Perhaps, with the exception of fumigation, I may say, as a general remark, that topical mercurial applications are not usually considered at all more useful than others which contain no mercury. The black, or calomel wash, is frequently made use of; but I do not know that it possesses more efficacy, than several other astringent lotions, which have not a particle of mercury in them.

With respect to the introduction of mercury into the system from the surface of the body, this can be accomplished either by rubbing mercurial ointment into the skin, or by mercurial fumigation of an extensive portion of the surface of the body. Friction with the ointment, the ordinary method, the most generally adopted, as requiring no machine for the purpose, is practised by the patient himself, who rubs some part of his body, which is frequently the inside of the thigh, for a quarter of an hour or twenty minutes before the fire, sometimes once a day and sometimes twice, with half a drachm or a drachm of the ointment. The quantity of ointment employed, however, varies in different cases, according to circumstances. Sometimes a scruple, sometimes half a drachm, and, in other instances, double this quantity, or even more, may be employed at a time. This is termed *rubbing in*, because a portion of the ointment seems as if it had been made to enter the pores of the skin by the friction; but, except where the patient is very easily affected, what remains on the surface of the skin should not be wiped away, the patient putting on a pair of flannel or other drawers over it. I ought to mention, however, that sometimes friction and the rancidity of the ointment together (for we seldom meet with mercurial ointment perfectly free from rancidity), will bring out numerous pimples, and even erysipelatous inflammation, and then the patient should be directed to repeat the friction on another part, and not to leave any of the ointment on the skin. A few years ago, friction with mercurial ointment was commonly preferred in this country to all other plans of treating the venereal disease; first, because it was conceived to be the most efficient mode of treatment, and the mercury in the ointment being combined with a very small proportion of oxygen, was usually given as one reason for the alleged fact; secondly, because it occasions less risk of disturbing the stomach and bowels than internal preparations; thirdly, because it is frequently considered to be the only certain way of getting a sufficient quantity of mercury into the system. Preparations of mercury, given by the mouth, sometimes disorder the stomach and bring on diarrhœa. I have long suspected, that the latter was the principal cause of mercurial friction being formerly so favorite a practice; for, while the doctrine prevailed, that it was necessary for the cure of syphilis to fill the patient with mercury, to saturate him with it from head to foot, and to salivate him unmercifully, the stomach and bowels often revolted against the scheme, which absolutely could not be carried into execution in every instance by preparations, designed for internal administration. It was then chiefly by means of mercurial friction that the old fiercely salivating practitioners were enabled to get into the system as much mercury as they wished; not that they did not also give internal preparations so far as they could. I believe that the doctrine of the superior efficacy of mercurial friction is founded on prejudice, and that, unless the stomach and bowels be disordered, and the constitution cannot be affected with moderate doses of the blue pill, it is seldom indispensably necessary to have recourse to this uncleanly practice. In certain cases, we are indeed obliged to direct mercurial frictions, as when the stomach and bowels will not bear even a small quantity of mercury, which occasionally happens, or when it is necessary to resort to more plans than one, in order to bring the system under the influence of the mineral. Under these, and perhaps a few other circumstances, we may be called upon to prescribe frictions, as well as internal preparations.

Fumigating the surface of the body is not at present deemed so necessary and eligible a method of putting a patient under the influence of mercury, as some of its admirers once endeavored to instil into the minds of the profession. It is attended with considerable trouble and inconvenience; it requires a particular machine somewhat resembling a sedan-chair, in which the patient sits naked with his head out of an opening at the top of it. At the bottom of the machine is an iron heater, on which a preparation of mercury is thrown, which is sublimed and covers all the surface of the patient's body. The preparation of mercury employed for this purpose is the grey-oxide. Another mercurial powder, that was recommended and used by Mr. Abernethy, was calomel that had been put into liquor ammoniæ, and then dried. After having undergone the process, the patient puts on his shirt or flannel waistcoat, and goes to bed. The reasons formerly urged in favor of the practice were, that it is less fatiguing to a debilitated person than mercurial frictions, and that the system can be more quickly brought under the influence of mercury than in any other way whatsoever. This seems to have been Mr. Abernethy's opinion, who was once an advocate for fumigations; but afterwards relinquished them. With regard to the reasons given for the use of fumigations, that mercury may thus be employed, when the patient is in the weakest state, and that he may be mercurialised without the fatigue of friction, or the risk of disordering his stomach and bowels with internal preparations, the argument, though plausible, has not really much weight; because, when the health is seriously impaired, we are seldom justified in giving mercury at all; and, at all events, it should then never be introduced so rapidly into the system. But, if the plan deserves adoption in any particular instance, it may be useful to know, that it is not necessary for the patient to go into the machine at all; he may turn his flannel waistcoat and drawers inside out; and put them into the machine to be fumigated. They will become covered with the fine powder sublimed from the heater, and, on being worn afterwards, will salivate the patient as well as if he had gone into the machine himself.

Of the *internal preparations*, the *pilula hydrargyri*, or *common blue pill*, has the greatest reputation in this country; it is one of the mildest of all the internal preparations; the common dose of it is five grains; but frequently we are called upon to give a larger dose, and sometimes a smaller; from three to ten grains may be stated to be the ordinary average quantity proper to be given in the twenty-four hours. We may join it with other medicines, according to circumstances, as with the sulphate of quinine, the iodide of potassium, extract of conium, and various other medicines. It is often combined with a small quantity of opium, in order to lessen its tendency to affect the bowels.

The *chloride of mercury*, or *calomel*, is not extensively employed in England for syphilitic complaints, though it is a favorable medicine for this purpose abroad, especially in Germany. Even in England, for one effect of the venereal disease, calomel is usually preferred, viz. syphilitic iritis. This preparation, like the blue pill, may be joined with other medicines, as with guaiacum and the sulphuret of antimony, as in the *pil. hydrarg. chlorid. comp.*, which is not unfrequently prescribed in venereal affections, but especially in those requiring merely slight alterative treatment.

The *bichloride of mercury*, or *corrosive sublimate*, is a very powerful medicine, and, if it be incautiously given, it may readily poison the individual. The dose is small, the average quantity usually given, is one eighth of a grain, twice or thrice a day. When mixed with distilled water, it dissolves more readily if a small proportion of the chloride of ammonia be added. There are instances, in which from half a grain to three quarters of a grain may be prescribed in divided doses to be taken in a day. When it is wished to give it with bark, we may dissolve one grain of it in an ounce of the tinctura cinchonæ, of which a teaspoonful is the proper dose. The *biniodide of mercury* (L. P.) in the form of an alcoholic solution, is sometimes deemed useful in obstinate forms of syphilis, occasionally met with in very scrofulous subjects. The proportions are, alcohol at 36° 1 1-2 ounce; deuto-ioduret of mercury 20 grains. The dose 10, 15, or 20 drops in a glass of distilled water.

The *hydrargyrum cum creta* is the mildest preparation of mercury ever employed in this country, and, on this account, is preferred where we wish to exert a slight mercurial influence on the constitution. It is deemed the best preparation of mercury for infants laboring under syphilis.

One caution is necessary in the employment of mercury; namely, to watch its effects very attentively; for it will act differently on different individuals. Some will be violently salivated by a few grains of blue pill, or a scruple of blue ointment; while others will use from one to three drachms of it daily for months together, with no manifest effect on the function of the salivary glands, bowels, or other organs. The doses of mercurial preparation must then be regulated by circumstances; indeed it is wholly impossible to give any precise rules on this head, on account of the different effects of the mineral on different individuals. I may say, however, that the safest plan is always to begin with small quantities of mercury, watching the effects of the medicine, and being guided by them.

The action of mercury on the animal economy is very powerful; the nervous, the absorbent, and the sanguiferous systems are all considerably affected by it; an universal irritability is excited; there is a quickness of the pulse, and a feverish state of the whole constitution brought on by it; the secretions are all increased, especially those of the skin, kidneys, and salivary glands. *Salivation*, or an increased secretion of saliva, and a soreness and swelling of the gums and mouth, are the effects which surgeons have long been accustomed to observe with attention; for these are usually regarded as tests of the remedy having a sufficient influence on the system effectually to cure the complaint, for which it is given; not merely to cure the *primary symptoms*, but give the patient the best possible chance of escaping the *secondary ones*. In fact this is the main object of giving mercury; we know that we can cure the primary symptoms without mercury; and were these alone abstractedly considered, perhaps, we should seldom be justified in salivating the patient at all. But the great argument for the mercurial practice is, that, without it, the patients will be more likely to be attacked by secondary symptoms. However, even on this point, I doubt whether secondary symptoms are more frequent after the treatment of primary sores with the iodide of potass and sarsaparilla, than after mercurial treatment, and, at all events, many gentlemen who watch the results of the first mode of practice commonly adopted in University College Hospital, know that the secondary symptoms, when they do follow it, which is not very frequently, are but slight compared with cases brought to this hospital from others, where the God Mercury is more rigorously worshipped.

The first change perceived is a copper taste in the mouth; the breath acquires a peculiar fœtid smell; sometimes letting out a secret which the individual may not always wish to be known, namely, that he is under a mercurial course; his watch and the money in his pocket will also, in consequence of the transpiration of the mercury from the surface of the body, become coated with mercury, so as to let out the same information. When mercury is given in ordinary doses, a swelling and sponginess of the gums are generally brought on—an inflammation and tenderness of them; an uneasiness, pain, and looseness of the teeth, and more or less inflammation of the mucous membrane of the mouth. When the constitution is remarkably susceptible of the action of mercury, a very small quantity of it will sometimes throw the patient into a violent salivation, attended with ulceration and even sloughing of the parts in the mouth. The gums and mucous membrane of the mouth will ulcerate; the edges of the tongue will be in the same condition; and the tongue itself may swell to an enormous size, and be pressed against the teeth; in consequence of which deep ulcerated indentations will be formed in it. I have frequently seen the ulceration so severe as to extend through the cheek, and even produce extensive mortification of the parts, with necrosis of the jaw. It is this risk, which should always induce us to begin with small doses of mercury, and to watch their effects. The quantity of saliva, discharged from a patient in a complete salivation, is sometimes very copious —from three to four pints may be poured out in the twenty-four hours. I never look upon a patient, in a state of violent salivation, without a feeling of disgust, for I know that it is a practice completely unnecessary—nay, it is highly prejudicial; and I should therefore say, it is a cruel mode of administering mercury, by no means justified by anything, which is made out respecting the true character of the venereal disease. I am happy to say, however, that such practice is not now common in London; but whoever had the opportunity of seeing the mercurial courses, pursued in the foul wards of hospitals a few years ago, will never forget the horrid scenes there displayed. At that period, an immense number of deaths were actually produced by the abuse of mercury. If it be introduced too quickly or copiously into the system, we may not be able to stop the salivation for a considerable time. Thus, a poor woman, whom I lately attended, was at first under a physician, who gave her ten grains of blue pill in divided doses: this quantity produced a most violent salivation, with loss of all the teeth, and ulceration, and sloughing. Here no blame could attach to the practitioner; there must have been an idiosyncrasy concerned, or an extraordinary susceptibility of the action of mercury, such as could hardly have been contemplated. But even in common constitutions, these severe effects will sometimes come on before we are able to check the mercurial action; and, I may say, that we know of no means that will check a violent salivation so quickly, as mercury will sometimes bring it on. The usual plans, resorted to for this object, are exposure to cold air, the exhibition of saline purgative medicines, and the use of gargles, especially those containing the chloride of soda. When there is ulceration, the same gargle, or one of hydrochloric acid, may be used.

There are one or two interesting questions connected with this part of the subject: one is, how far salivation is a right criterion of the influence of mercury on the constitution? and another is, how far it is a means of judging whether that influence is such as affords the patient the best chance of secondary symptoms being prevented, and the primary affection cured in the most expeditious and favorable manner? Perhaps I may state, as a general fact that salivation is a good test for these purposes: but the remark is liable to exceptions; for some individuals cannot be salivated by any quantity of mercury, and yet their venereal complaints will get well with tolerable facility; while others may be salivated by a few grains of

Google

blue pill, and therefore long before any adequate mercurial impression can have been made on the disorder. But supposing salivation to be generally a good test of the proper influence of mercury on the system, then the question arises—to what degree are we to understand that salivation is to be carried? Certainly not so far as purposely to bring on ulceration and sloughing of the mouth, or even to produce so profuse a discharge of saliva as to make it run out of the mouth in streams: this is not at all requisite as a test of the adequate influence of mercury. I should say, that a moderate swelling and tenderness of the gums, a distinct copper taste in the mouth, and a gentle increase in the secretion of saliva, are the three conditions which we should aim at bringing about; a more violent mercurialisation is not only generally unnecessary, but decidedly injurious. Neither are we to imagine, that mercury should be given in the same quantity during the whole time that the medicine may be proper; sometimes it may be necessary to suspend the use of the medicine in consequence of the gums getting too tender: and, under other circumstances, where the constitution is difficult to affect with mercury, we may be required to increase the quantity of it. Indeed, there is only one general rule which I can offer, and which was laid down by Mr. Hunter, namely, that we must be guided, in the administration of mercury, partly by its influence on the disease, and partly by its influence on the constitution.

As for the length of time that the salivation should be kept up, it is difficult, also, to lay down any precise rules on this point; sometimes all the specific characters of the ulcer are removed long before it is healed, and sometimes a chancre heals so rapidly, that we have little opportunity to give mercury before it is well. When the complaint yields in this rapid manner, it is usual to continue the employment of mercury for ten days or a fortnight, and this is done to diminish the risk of secondary symptoms. In other instances, where the sore heals very tardily, perhaps when a bubo is also present, the disease will not get well for months, though all the specific characters of venereal ulceration may be removed; then, of course, we should not think of continuing mercury till cicatrisation had taken place.

The diet and regimen to be observed during a mercurial course is a subject of importance, because if we give a patient mercury, and allow him to continue his usual diet, and to follow his common occupations, we shall generally be disappointed in the results of our treatment. If we allow a patient to take wine and a full diet, to walk about the streets, to expose himself to all weathers, and even to ride on horseback, as some are disposed to do, I think it will be found that secondary symptoms are more likely to come on, and even affections of the periosteum and bones will be more frequently produced. I always recommend patients to clothe themselves more warmly than usual, and to confine themselves at home; but there are many who will not submit to this: they say they are obliged to to their offices, or counting-houses, and that they have no choice; I tell them that, if this be the case, any unfavorable circumstances which may occur must be imputed, not to my having omitted to give them good advice, but to their not following it.

As mercury produces a quickness of the pulse, and a feverish state of the system, it is advisable not to let the patient have a full meat diet; it is better for him to live on light farinaceous food, such as milk, sago, arrow-root, &c. This practice is consistent with medical science on another account; for, in many venereal cases, there is a good deal of inflammation present; perhaps in the groin there may be severe inflammation, or a similar state of the throat may exist. Under these circumstances, letting the patient have a full diet would be contrary to all the rules which influence both physicians and surgeons in their treatment of disease in general. When the patient is in so reduced and weak a state, that it is necessary to let him have plenty of animal food, I should say, that mercury can rarely do him any good. It is especially necessary, also, during a mercurial course, to recommend abstinence from all acid drinks and acid fruits; for mercury has often a tendency to produce diarrhœa, and mercurial friction will sometimes act more on the bowels than on the salivary glands. When diarrhœa has been induced by the use of mercury, the condition of the patient is much the same as if he had dysentery: a slimy matter is discharged from his bowels, and frequently blood. Under such circumstances, we must discontinue mercury, for the further administration of it would not only do no good to the venereal complaint, but put the patient's health into a most dangerous state. The mercury should be left off, and recourse had to opium and rhubarb, or the chalk mixture.

Sometimes mercury has a peculiar effect on the skin, causing a specific eruption, named the *mercurial erythema*, or *eczema*. It is generally preceded by an increased heat of the surface, accelerated pulse, difficulty of respiration, and more or less fever. On the first or second day after the feverish attack, the erythematic affection makes its appearance, sometimes bearing a considerable resemblance to urticaria, or nettle-rash, and when it assumes this form, the disorder will always prove very slight; but, in other instances, large red patches appear on the surface, crowded with vesicles, which, uniting altogether, may cover the greater part of the body. After a time they burst, and form incrustations on the skin, and the patient, from the extent of surface affected, is really in a very distressing condition. Under wrong treatment, this is actually a dangerous complaint; and, in former times, when the disease was supposed to be syphilitic, the quantity of mercury used to be increased, and the patient destroyed.

Former practitioners were confirmed in their suspicions, that this was a syphilitic eruption, by the fact, that eruptions are rarely the consequence of mercury, but very frequently the consequence of the venereal disease; therefore the cutaneous affection was ascribed to the latter disorder, and treated as such by pushing the mercury in greater quantities, according to old maxims and firmly rooted prejudices. As the mercurial erythema sometimes comes on, when only a small quantity of mercury has been exhibited, it is supposed that it can occur only when there is a particular idiosyncrasy in the individual: it is asserted that it never takes place, except when the patient has been exposing himself to cold damp air. Here, then, is another reason, why the kind of regimen, which I have recommended, should be attended to. Sometimes the eruption begins on the part where the patient has been rubbing in mercury, as on the thigh or leg; but, in many instances, it comes on, though the mercury has been given only internally; so that the friction is not essential to its production. The treatment consists in fomenting the parts well with a decoction of poppy-heads or chamomile flowers, discontinuing the mercury, as a matter of course, and administering small doses of antimonial powder and saline purgatives, or castor oil. When the inflammation has abated, and there is merely a discharge from the surface, sarsaparilla may be given, or bark with diluted sulphuric acid, and a light nutritious diet. The warm bath will also afford great relief. If the part be excoriated, it will be necessary to apply the zinc ointment.

Mercury acts upon some individuals like a poison: they are seized with palpitations of the heart, tremblings of the limbs, oppression of the breathing, and irregular pulse. When such indisposition takes place in a person employing mercury, me may conclude, that this mineral is actually producing a deleterious impression on the system. It was noticed by the late Mr. Pearson that every year, when it was the custom to salivate freely, a certain number of individuals, thus treated, died suddenly, in the Lock Hospital; they were first affected as I have described, and, on attempting to make the slightest effort, they dropped down dead. Mr. Pearson learned from experience, that these deaths arose from the deleterious action of mercury on the constitution, and the derangement of the system, thus excited, he proposed to call *mercurial erythismus.* I need hardly say, that the treatment consists in suspending the use of mercury altogether, letting the patient be exposed to a pure, cool, dry air, administering tonics, especially sarsaparilla, or, as some practitioners prefer, ammonia in camphor mixture.

With regard to other medicines, often given in some stage or another of venereal complaints, we should, in estimating their antisyphilitic power, never forgot the important truth, that mercury is not absolutely necessary for the cure of the generality of venereal complaints; for, so far as Mr. Rose's inquiry went, he never met with a case which he could not cure without mercury. Mercury is frequently useful in accelerating the cure, and, perhaps, with the exception of the iodide of potass, still more importantly serviceable than any other known medicine, in lessening the frequency, though, I believe, not the severity, of secondary symptoms. Yet, let not these advantages render us blind to the fact, that mercury is not absolutely necessary for the cure of syphilis; and, in estimating the anti-syphilitic power of any medicine, this truth must never be lost sight of. Sometimes, indeed, mercury, so far from being indispensable to the cure, may have the effect, in particular states of the health, of retarding or even preventing altogether, the patient's recovery. Frequently the general health becomes bad before a venereal complaint is cured, and then, on the mercury being discontinued, the health improves, and a cure of the syphilitic affection follows. This frequently occurs, and gives a kind of false credit to any medicine which may have been prescribed after the discontinuance of mercury. It is, perhaps, in this manner, that sarsaparilla has acquired the reputation of having anti-venereal qualities:—the patient is taking mercury, and his health suffers; the mercury is left off, and then a favorable change takes place in the constitution, and chancres, buboes, secondary ulcers, &c., yield, whether sarsaparilla be given or not. Yet, I by no means wish to insinuate, that sarsaparilla is completely useless; probably it has some good effect in accelerating the cure, independently of the benefit derived from our stopping or moderating the mercurial course. Nothing can be more various, than the opinions about the real efficacy of sarsaparilla:—Dr. Cullen believed that it has no power at all; and it is found, that if we give it to a person in health, it makes no sensible impression on the constitution; it does not affect the pulse; neither does it materially increase any of the secretions. Hence it has been presumed, that it possesses little or no power. Fordyce thought it useful in certain complaints that would not yield to mercury; and the late Mr. Pearson came to the conclusion that though sarsaparilla was, in a certain degree, useful in venereal complaints, it could not cure them without mercury. The latter part of this opinion we now know is erroneous. He also says, that sarsaparilla is particularly valuable as a means of obviating the pernicious effects produced on the system by a mercurial course; and, in his day, when mercury was given copiously, and its action maintained for a considerable time, these effects were often of a severe description. At the present day, sarsaparilla is commonly given at the end of a mercurial course; and, so far as I can judge, the practice is attended with beneficial effects, restoring the patient to health much sooner than if he did not take the medicine. It is also used as an alterative in various complaints reputed to be venereal, though not exactly possessing the characters of the disease insisted upon by Hunter, or those of the scaly venereal disease, as described by Mr. Carmichael. Many affections, arranged with venereal ones, undoubtedly yield to sarsaparilla, and alterative plans of treatment, even better than to a full mercurial course. We often find this benefit accrue from sarsaparilla, given either with small doses of bichloride of mercury, with nitric acid, with iodide of potass, or antimonial medicines; and numerous cases present themselves which are more served in the beginning, by this method of treatment, than by mercury; though, in a later stage, mercury may be administered with surprising effect. In University College Hospital, at least two thirds of the venereal cases are readily cured without mercury, small doses of the iodide of potassium with sarsaparilla being substituted for it; and it is well known that our cases are far from being often followed by secondary symptoms; which, when they do occur, are for the most part exceedingly mild and easily cured. Instead of having recourse to mercurial frictions, and violent salivation, I also, sometimes, adopt the practice of giving a few grains of the blue pill daily, in conjunction with the iodide of potassium; and the efficiency and mildness of this method, where mercury is called for, give me a favorable opinion of it. With respect to the compound decoction of sarsaparilla, and the mineral acids, they are all useful in particular stages of the disease, where the health is not in a favorable state for the action of mercury; but whether any of them really possess what is sometimes understood by an anti-syphilitic power is a question that resolves itself very much into the consideration, how far syphilis is capable of getting well without mercury, and how far it admits of a spontaneous cure. Certainly it is quite conceivable, that, although the cure of the disease may sometimes be promoted by the discontinuance of mercury, it may still admit of being expedited in a greater degree, when, with this change in the treatment, we join the administration of sarsaparilla, or other alterative medicines. Another circumstance, never to be forgotten, is, that venereal complaints are frequently complicated with common as well as with specific inflammation, and, consequently, that they often call for antiphlogistic treatment. The whole of the inflammation attending the effects of the venereal disease is not specific : a good deal of it is merely common inflammation, and may be benefited by the same means as are usually resorted to for checking inflammation in general,—bleeding, leeches, cold applications, poultices, low diet, quietude, &c.

From these general observations on the venereal disease and its treatment, I now proceed to consider more particularly each of the primary and secondary symptoms.

CHANCRES,

It is not strictly because a sore has been contracted in a suspicious sexual intercourse; nor on account of its situation; the greater or lesser induration at its base; its color; its excavated surface;

its undermined callous edges; or its deep red margin, that it must necessarily be concluded that it is always a chancre; but the inference, according to M. Ricord, is rather to be deduced from the kind of pus which it secretes, and the contamination which such pus is capable of imparting. All the other conditions may vary, the secretion alone, and its general consecutive effects remaining the same.

The term *chancre*, as conveying the idea of an ulcer that has a corroded appearance, is not exactly what ought to be employed; perhaps the expression *primary sore* is preferable. It is not every sore, arising from sexual intercourse, that is to be considered a chancre; there are many which are supposed to be produced by the irritating action of the secretions of the genital organs, more or less changed. Sores, produced in this way, are not uncommonly classed with venereal ones, though not having the aspect which the meaning of the word *chancre* would convey; and for this and other reasons, the term *primary sore* seems preferable. Primary sores are most frequently situated on the external parts of the organs of generation, and especially on those parts of them which are covered by a thin delicate membrane, as on the inside of the prepuce, and on the glans penis, or corona glandis, in the male subject, and on the labia, nymphæ, &c. in the female. They are also sometimes met with in other situations about the genital organs, as on the common integuments of the penis, or on the skin of the labia, and sometimes, as all surgeons now admit, actually within the orifice of the urethra or vagina, though less frequently in these situations, than in the others which have been specified. The formation of chancres on the outside of the labia, in the perinæum, and on the common skin of the penis, seems to prove, that the venereal mattar may produce ulceration even in situations where a thick cuticle intervenes between it and the cutis, so far as those parts are concerned. I am not aware, that there is any clear proof on record of a venereal primary sore having been produced on any common part of the general surface of the body, away from the genital organs, unless there had been a wound, ulcer, pimple, or some kind of breach existing in the situation at the period when the matter was applied.

The period of the commencement of venereal ulceration, after the application of the virus, is extremely irregular. Mr. Hunter met with chancres which began within twenty-four hours after exposure to contamination; but knew of other cases, in which the sores did not make their appearance till six or eight weeks after coition. Perhaps, a true primary venereal ulcer does not often form earlier than six or seven days after the application of the virus. On an average, says Dr. Wallace, of a number of cases of primary syphilis, *produced by artificial inoculation*, notes of which are now before me, the phlogosis, or redness, commenced on the second day: the stage of ulceration occupied seven days; that of granulation ten days; and cicatrisation six days; making the whole period from the insertion of the virus to the healing of the ulcer twenty-five days*.

Primary venereal sores are of several kinds. The most remarkable is that which was so well described by Mr. Hunter, and is called, accordingly, the *Hunterian chancre.* It is characterised by a tendency to assume a circular form, its excavated surface, the tenacious and adherent quality of the matter produced on it, and by its hard cartilaginous base and margin. It generally begins as a pimple, or minute vesicle, which enlarges, and soon breaks and ulcerates. Generally speaking, venereal ulceration does not extend itself with great rapidity; neither is it the common character of the Hunterian chancre to make quick progress. Nevertheless exceptions to this statement do occur, and these seem to depend on the state of the health: for when this is in an unfavorable condition, certain forms of constitutional disturbance and irritability prevail, the ulceration will spread with greater quickness than usual. When the sore is situated on the prepuce, or the frænum, there is usually more inflammation present than when it is situated on the glans. When the ulcer is on the glans, it is less painful, but more disposed to give rise to hæmorrhage. What is termed *phymosis*, is an inflammation, a thickeing, and a contraction of the extremity of the prepuce, rendering it impossible to draw it back so as to uncover the glans: this case is less frequently a consequence of the Hunterian chancre, than of some other primary sores on the penis. My own experience does not incline me to adopt the opinion, that the hard cartilaginous base of the Hunterian chancre is essential to a sore, that is capable of imparting to the system such effects, or secondary symptoms, as are exclusively regarded as syphilitic. Neither does it lead me to join in the statement of M. Ricord, that the indurated chancre is more frequently than others followed by secondary symptoms.† All surgeons know, that the Hunterian chancre may, and often does, give rise to secondary symptoms; but there are other kinds of primary sores, which will produce similar complaints, so similar, that they cannot be discriminated. It is curious to find, that the frequency of the Hunterian chancre is much lessened in London, though still very common in Paris, as I learn from my friend Mr. Morton, of University College, who has spent the last two summers in attending the Parisian Hospitals.

Another kind of primary sore is that which is generally called the *superficial ulcer with raised edges;* it is not accompanied by induration, but its margin is very high; it is often seen on the outside of the prepuce; and frequently is not a single sore, but is accompanied by others of the same nature, sometimes by two, three, four or more. In many instances, we see them surrounding the orifice of the prepuce, producing a thickening of it and phymosis, which may continue long after the cure of the sores. Sometimes we notice some of these superficial ulcers on the corona glandis, and others under the prepuce, or around its orifice, or just on the outside of it. They are frequently very obstinate, and it may be long before any impression can be made upon them, whether mercury be given in full quantities, or merely in alterative doses. Sometimes, in five or six weeks, there will be very little change in them whatever is done, and what change does take place, may be for the worse. I have seen thousands of them in my lifetime; but I have observed, that, after five or six weeks, they generally yield to common treatment, to mild alterative plans, namely, to small doses of iodide of potass or mercury, aperient medicines, and antimonials, and sometimes to bark, sarsaparilla, and the mineral acids. At first, the surgeon will be discouraged by finding them resist all plans of treatment. One common situation for such a sore is just at the side of the frænum, which is generally soon destroyed. The black or yellow wash, the nitrate of silver, or lotions of the sulphate of copper, or zinc, are the best applications.

---

* Wallace on the Ven. Dis. p. 71.

† Op. cit. p. 93.

Another description of primary sore is the *phagedenic*, as it is termed,—a corroding ulcer without granulations, corresponding to the description of phagedenic sores in general. It is destitute of any remarkable degree of surrounding induration, but its circumference is of a livid-red color. It is invariably rendered worse by mercury, a fact, which I deem to be as well established as any thing yet made out, with regard to the treatment of venereal complaints. In this form of the disease, when the treatment is injudiciously conducted, the whole of the penis is frequently destroyed in a very short time. Sometimes considerable hæmorrhage takes place, and a useful hint is afforded by it; for we commonly observe, that, after loss of blood, the extension of the ravages of the disease stops, or is suspended for a time; and hence we may infer, that venesection will frequently be useful in the early stages of the disease, a truth fully confirmed by experience.

Another is the *sloughing ulcer*. It appears first a black spot, which increases, and is thrown off, leaving exposed to view a corroded or phagedenic surface. After the slough has separated, an ulcer may remain of a painful character, with a dark blue, or livid crimson margin. In this manner the disease will go on alternately sloughing and ulcerating, sometimes till nearly all the external parts of generation are destroyed. With respect to the hypothesis, that phagedenic primary sores derive their origin from a specific poison, various considerations oppose its adoption. The sore is always phagedenic from the beginning, which we should naturally suppose would be

Google

the case, if it arose from a specific poison. The causes of phagedenic ulceration may frequently be traced very unequivocally to the condition of the individual's health; to his having neglected to restrict himself to proper regimen; to his having been guilty of excess; or to his having neglected some other kind of primary sore in its commencement. The opinions I have delivered on primary phagedenic sores, derive considerable support from the observations of Mr. Travers. Numerous phagedenic venereal ulcers, of a particularly severe character, are brought into St. Thomas's Hospital from a particular district of the town, namely, Swan Alley, near St. Katharine's Docks, in consequence of which the disease is familiarly known in the Borough hospitals by the name of the *Swan Alley Sore.* I have seen the same disease in St. Bartholomew's, brought, I believe, from other alleys. The genuine form of it, however, as described by my friend Mr. Travers, is usually seen in very young girls, who reside near St. Katharine's Docks, and have frequent connection with sailors, Lascars, and other men of color. It usually shows itself in the cleft of the nates, in the groin, or on one of the labia towards the perinæum, and as it enlarges, the surrounding skin puts on a crimson color; its surface is generally covered with a deep ash-colored slough; it often extends with alarming rapidity, producing great constitutional disturbance and intense pain; the appetite is lost, and extreme prostration of strength attends the disease throughout the greater part of its course. This kind of sore is rarely or never followed by secondary symptoms; a fact, confirming the view I have taken, that this sore does not depend on a specific poison, but is in a great measure accounted for by the state of the health at the time it is contracted. We learn from Mr. Travers's statements, that most of the young creatures who are brought from that genteel place, Swan Alley, afflicted with phagedenic ulceration, have had very little wholesome food; they are generally kept by Jews and Jewesses, who give them plenty of gin, though but little proper nourishment. They are half starved, and more or less in a continual state of excitement and intoxication, having connection with Lascars, and other dirty foreign seamen, as many times in the day as there are hours. In this manner, their constitutions must soon get into a very disadvantageous state for the favorable progress of any disease whatever, and we cannot wonder, that their impaired, imperfectly developed frames, their course of life, and uncleanliness, should promote phagedenic ulceration, and give it an unusually severe character.

If proper treatment be not delayed too long, however, we shall generally be able to stop the progress of the disease; but if the case be neglected or wrongly treated at first, the ulceration will often make such havoc, as to destroy all the soft parts, closing the lower aperture of the pelvis. I have seen cases, whose severity was even to this extent, and then of course the result was fatal.

Although I have given it as my opinion, that phagedenic ulceration does not necessarily depend on a specific poison, I would not wish it to be imagined, that sores, originally excited by the venereal virus, are not convertible into phagedenic ones: on the contrary, I believe, that any sore may assume the phagedenic character in particular states of the health, or in consequence of bad treatment; but that, in the greater number of phagedenic sores, there is no specific poison concerned at all in their production, and never essentially as a cause of them.

Dr. Wallace has attempted to form a classification of phagedenic and sloughing chancres. One of his principal divisions is into *phagedenic chancres without slough; phagedenic chancres with white slough; phagedenic chancres with black slough.* For these last, he does not recommend mercury; but, when the slough is white, and also when the case is phagedenic without any slough, he frequently resorts to that mineral. But, whoever carefully reflects upon the bad effects, admitted to arise from the free use of mercury in phagedenic cases, will not find great reason to imitate the practice.

With respect to primary venereal sores, we should be careful not to confound with them several common complaints which cannot even be suspected to be connected with, or to originate from, any kind of virus, as, for example, the disease called *herpes preputii*, which begins with heat and itching of the foreskin, and, in one or two days, is followed by red patches as large as a silver penny, on each of which may be remarked five or six small vesicles, which lose their transparency in a few days, and become filled with pus. They then burst, and the fluid oozing out of them, and drying, forms scabs. *Excoriations of the corona glandis* too, and of the prepuce, are common in individuals who are not cleanly, and who neglect to wash these parts occasionally. Under such circumstances, troublesome excoriations will be likely to be produced by the lodgment of the natural mucus, and its becoming acrid and irritating. These cases merely require cleanliness for their cure. Patients with such excoriations often ask our advice, and if we give them mercury we give it unnecessarily; nothing is required but a weak solution of the sulphate of zinc, or a lotion of rose water and subcarbonate of potash. There are also cases, in which there is a scaly appearance of the prepuce, a kind of *psoriasis*, which mus not be mistaken for a venereal complaint.

The old practitioners sometimes cut chancres completely away; in other instances, they destroyed them by means of caustic. The latter practice is often followed at the present day, when the sore is recent and of small size, in order to lessen the chance of secondary symptoms. The late Dr. Wallace particularly insisted upon the usefulness of this practice, on the ground, that if its surface can be destroyed in the early stage, before granulations form, the risk of secondary symptoms from absorption will be greatly diminish-

Google

ed.[*] "If, by any means," says Dr. Wallace, "the poisonous quality of an ulcer, produced by the direct application of the venereal virus, can be destroyed before the process of ulceration has ceased *in any point of the ulcer*, the contamination of the system will be prevented." The same practice is urged by M. Ricord; the secondary symptoms, he remarks, which can only take place after a chancre, do not occur in all cases, and, when they do follow, do not present themselves till after a certain period. To be convinced of this important point, the real beginning of a chancre must be discriminated from the supposed one; that is to say, the calculation is not to be made from the day when the patient first perceived the sore, but from the day when he actually contracted it. It will then be found, says M. Ricord, that if the ulceration be completely destroyed by caustic, or other means within three, four or five days after the application of the cause, such ulceration will not be attended with risk of secondary inflammation. "It is only about the fifth day," he continues, "that the induration of a chancre commences and it is ordinarily the indurated chancre that is followed by econdary symptoms. Such induration seems to M. Ricord, then, to denote, that the principle (that is, the active principle of the disease) has penetrated further into the system. While it is absent, he considers it allowable to suppose, that the disease is yet superficial. Dr. Wallace, I think, offered a better explanation in the fact, that absorption does not usually take place till granulations are formed on some part of the ulcer. During the two or three days spent by Dr. Wallace in the application of the nitrate of silver, he prepared his patient by a purgative, and by regularity in his mode of living, for subsequent constitutional treatment. In the meanwhile, lint dipped in the liq. plumbi acet., and covered with oiled silk, was applied to the sore. As soon as ulceration had ceased, and the process of reparation begun, he had recourse to mercury "to hasten the process of healing, and to diminish the chance of secondary symptoms." Although I do not concur with Dr. Wallace in so free a use of mercury, as he advocates, or in the use of it at all in some cases for which he recommends it, I am perfectly convinced of the usefulness of the maxim inculcated by him, as well as by M. Ricord, "that the sooner a primary sore is healed, the sooner the risk of several serious consequences, both local and constitutional, will be removed."[†] I have already stated, that all chancres are not to be treated alike. In phagedenic ulceration mercury is improper; the right plan at first is the soothing one; antiphlogistic treatment will be proper; and, if the patient be not too far reduced, and manifest traces of inflammation be present, venesection, saline antimonial medicines, sarsaparilla with mineral acids, and anodynes, such as conium, hyoscyamus, or the acetate or muriate of morphia, with low diet, and plenty of ventilation, and strict cleanliness, will form the best plan of treatment. Then to the ulcer itself it will be useful to apply lotions, containing opium or hyoscyamus, with a proportion of nitric acid. Quietude in the recumbent position is of course an essential thing. But in the worst kind of phayedenic ulceration, which I have adverted to, and which is accompanied by great debility, the diet must not be too low. We begin with putting the patient on a diet of eggs and milk, and when the stomach has acquired more power, the patient may be allowed a mutton chop every day, and from ten to twelve ounces of wine. Sometimes the undiluted nitric acid may be applied; in other instances, a lotion, consisting of a pint of distilled water, three drachms of the chloride of sodium, and one drachm of caustic potass, will produce a clean surface, and promote the formation of healthy granulations. The treatment of phagedenic venereal ulcers by compression has been recommended, but I cannot speak of it from my own experience.

---

[*] W. Wallace on the Venereal Disease, p. 53., &c. 8vo. Lond. 1833.

[†] Op. cit. p. 118.

Sloughing chancres are believed to be less frequently than others followed by secondary symptoms. "If from the violence of the inflammation," says Dr. Wallace, "a process of sloughing commences in a chancre, before the action of ulceration has ceased upon any portion of its surface, and if this process involves the structure of the part beyond the point of contamination, it may form, not only a natural cure of the local disease, but may also prevent contamination of the system." Hence, he accounts for the escape of many patients from the attack of secondary symptoms, whose chancres slough in the early stage. It would be erroneous to suppose, however, that no patients who have sloughing chancres experience secondary symptoms. In University College Hospital, the contrary fact is occasionally seen; but, under the treatment there adopted, the secondary symptoms have always been free from severity, and readily cured.

With respect to the treatment of the primary sore, characterised by a cartilaginous hard base and margin, the Hunterian chancre, as it is called, the employment of mercury is the common practice; but, there are differences of opinion as to the extent to which it should be carried. Some of those surgeons, who are decidedly against the free exhibition of mercury in other primary venereal sores, are strong advocates for it in the example now under consideration. Mr. Carmichael is one of this number; and, though he cannot be said to be generally an admirer of the copious administration of mercury, he recommends a full course of mercury for the Hunterian chancre. Frequently we hear it asserted, that thus the disease is cured sooner, and the chancre of secondary symptoms more effectually lessened, than by any other known plan. This doctrine would find, however, but little support in the facts brought forward by Mr. Rose; and, in University College Hospital, I have treated the Hunterian chancre, as successfully as other chancres, with the hydriodate of potassium and sarsaparilla, no mercury being exhibited. If mercury be preferred, it should be given so as to affect the gums, and produce a mild degree of salivation; but I would avoid bringing on a more violent action of it on the system, such as would occasion severe derangement of he health, by which the cure would be more likely to be retarded than quickened. At all events, I advise, in the first place, a trial of what the moderate action of mercury will do, aided by a proper regimen, before the patient is subjected to a severe and profuse salivation.

When a sore is situated under the prepuce, and the latter is so swollen that it cannot be drawn back, and the sore examined, we should always be careful to wash the matter away which collects under the foreskin. For this purpose, we should first use warm water, and then a solution of the acetate of lead or sulphate of zinc. Here, by attending to cleanliness, we are doing a great deal towards the cure. Now that the plan of giving mercury in moderate quantities is generally preferred to a violent and profuse salivation, we should do no material harm by following this method, even though the concealed situation of the sore might not let us judge of its exact character. In such a case, if the iodide of potassium were objected to, I should consider the exhibition of mercury, on the moderate plan specified, perfectly justifiable. Formerly, when the ulcer could not be seen, and when it was the custom to salivate the patient profusely, the question, as to whether mercury should be given or not, was a very serious one—it was virtually, whether the patient should or should not undergo a long and violent salivation? whether his constitution should be subjected to severe impairment or not? But now the decision does not involve a consideration of this importance.

If a chancre heal up quickly under the influence of mercury, the general rule is to continue the medicine for ten days or a fortnight after the sore has been cured. Another general rule is, that of not discontinuing mercury until the hardness of the base, upon which the chancre was situated, has been dispersed, for this is not uncommonly looked upon as the criterion of all diseased action having ceased in the part. Exceptions occur, however, where a chancre leaves a callous cicatrix, which will not yield to mercury; and, consequently, a perseverance in it beyond a certain period would do more harm than good.

One kind of chancre, situated on the lining of the prepuce, where it is reflected over the corona glandis, sometimes leads to an accumulation of pus between the skin of the dorsum penis and the corpora cavernosa. If an outlet be not made for the pus collected in this situation, it will sometimes spread up to the pubes, and a good deal of the skin of the penis be destroyed. Occasionally, several small openings take place, but they are insufficient to prevent the mischief. Here the best practice is either to make a free opening, or to slit open the prepuce from its orifice up to the corona glandis.

Dr. Wallace frequently demonstrated to the pupils of his hospital the remarkable influence of the nitrate of silver in stopping the progress of a chancre on the frænum. The tendency, which a chancre has in this situation to perforate the frænum, is universally known, and it is also usually believed, that, when such perforation has taken place, the ulcer cannot be healed until the whole frænum has been destroyed, and hence it is common to divide the perforated part with a bistoury. Now, Dr. Wallace affirms, that, in nineteen cases out of twenty, if the patient apply before the ulcer has perforated the frænum, its performation may be prevented, by the application of the nitrate of silver; and that, if the frænum be already perforated, the remaining portion of it may yet be saved by the same practice.*

Many surgeons do not place implicit reliance on the doctrine of the possibility of knowing whether a primary sore is venereal or not, by its mere appearance; and when there is doubt, it may be the wisest maxim always to give mercury, or the iodide of potassium, in moderate quantities. The successful treatment of primary sores materially depends on the kind of regimen observed by the patient; for if he neglect to keep himself quiet—if he expose himself to all weather, and be guilty of excesses, he will be liable to more severe consequences, than other patients with similar complaints, who conduct themselves more prudently. With respect to dressings, astringent lotions, and especially the black and yellow washes, usually answer better than greasy applications; and, when there is much inflammation, we should enjoin the recumbent position, which, indeed, has a great effect in promoting the cure of sores on the genitals, whatever be their character.

I will conclude these observations on chancres with a statement made by Dr. Wallace, which, as coming from a gentleman strongly attached to the mercurial treatment, merits great attention. "In dispensary practice, and among the lower ranks of society, says he, the internal administration of mercury, particularly at inclement seasons of the year, can seldom with safety be recommended. In such persons, and under such circumstances, topical applications (nitrate of silver and mercurial lotions) are of infinite value. In cases of this kind, I generally confine my treatment to them, in conjunction with the internal use of nitrous acid; and, by these means, I succeed, for the most part, in healing the disease with rapidity. *Cases, treated in this way, are also very seldom followed by secondary symptoms.*"†

---

* See Wallace on the Ven. Dis. p. 95.

† Op. cit. p. 118.

The venereal matter or poison, in its passage through the inguinal glands, frequently gives rise to inflammation and enlargement of them, which, in many instances, is followed by suppuration and ulceration. The swelling, abscess, or sore, thus produced, is termed a *bubo*, a name derived from a Greek word signifying *the groin;* though, if the patient happened to have a primary venereal sore on one of his fingers, he might have a bubo just above the elbow, near the inner edge of the biceps, or in the axilla; so that a bubo does not always signify a disease in the groin, as the etymology of the word would imply. But the poison of syphilis may make its way into the system, without exciting any inflammation in the absorbent glands of the groin, or other region of the body; no bubo at all may intervene between the occurrence of the primary sore and the commencement of secondary symptoms. In other terms, the latter are not invariably preceded by a bubo. On the whole, buboes form more frequently after a chancre on the prepuce, than after one on the glans; yet every inflammation of the glands of the groin must not be set down as venereal, for these parts are subject to various enlargements from other causes. Should a bubo occur in consequence of a chancre, before the ulcerating process of that chancre has ceased, Dr. Wallace deems it more likely that such a bubo has been produced by irritation than by absorption of the virus. This fact he considers to be tacitly admitted by those who have had most experience in venereal complaints; for, it is allowed, that buboes are most apt to occur after a lapse of some time from the formation of a chancre, and that, the longer a chancre has continued, the more likely is such bubo to be the forerunner of constitutional symptoms. Mr. Hunter observed, that, when the venereal poison affected one of the absorbent glands, the gland that inflamed was one of the nearest to the primary ulcer. Such, indeed, is the fact; and we never find that the absorbent glands, situated in the course of the aorta or iliac vessels, are inflamed, and brought into the state of suppuration by the absorption of venereal matter. The glands of the groin, then, may inflame, suppurate, and ulcerate, but not those within the trunk. Mr. Hunter entertained a suspicion, that another criterion of a venereal bubo was the circumstance of its involving only one gland; but, at the present day this test is not entirely relied on. Frequently, in venereal cases, several glands inflame; and sometimes, in glandular swellings from irritation, only one gland is concerned. Also, in a bubo arising from scrofula, there may be only one gland affected at first; so that the distinction suggested by Mr. Hunter cannot, I believe, be depended upon. However, Wallace, Ricord, and others incline so far to the doctrine of Hunter on this point, as to represent the *venereal* bubo as most frequently seated in a single gland. "When absorption takes place from a chancre of the genital organs," observes M. Ricord, "the bubo only takes place in the *superficial* glands, and most commonly only in one of them at a time; though several may inflame and swell, both superficial and deep, so that one gland may actually have all the characters of a virulent bubo, while others near it, in which the inflammation may also advance to suppuration, as well as the surrounding cellular tissue, may present only one of a simple kind, quite free from virulence."* Another character, assigned by Mr. Hunter to a venereal bubo, is the quickness with which it generally proceeds to suppuration, and the shortness of time which the matter requires to make its way to the surface. I am afraid that this test, also, is not of much practical importance; for there is great variety in venereal buboes in this respect, some being much more indolent than others. It is far from being the invariable character of venereal buboes to proceed rapidly to suppuration; for while some of them are very acute, corresponding more or less to Mr. Hunter's description, others are of a chronic character, and this frequently cannot be accounted for, either by the influence of scrofula or mercury, the two circumstances which Mr. Hunter believed would generally explain it.

The venereal poison excites inflammation and abscess in the lymphatic glands much more frequently than in the lymphatic vessels.

Such buboes as are supposed to arise from the venereal poison, but have not been preceded by any chancre, are sometimes called *primary buboes*, and by the French *bubons d'emblee*. But, when a bubo follows a chancre, it is occasionally termed a *consecutive bubo*. If the bubo has made its first appearance in the stage of the constitutional symptoms, M. Ricord names it a *secondary bubo*. A *sympathetic bubo* means one not proceeding from the action of the venereal poison, but irritation in the urethra, lower extremity, or other part. Buboes are also divided into *acute* and *chronic; inflammatory* and *indolent; suppurating* and *ulcerated.*

The pus, formed by a venereal bubo, is well known to be capable of communicating the disease by inoculation; though, for reasons readily understood, if what has been stated by M. Ricord be correct, the matter secreted by the surrounding cellular tissue, or other glands simply inflamed at the same time, will not be infectious, and, consequently, if it happen to be employed, the inoculation will not communicate the venereal disease.

The generality of buboes, not truly venereal, are preceded and accompanied by more or less disorder of the health; and under such circumstances, if there were no chancre to account for the bubo, we should have reason for suspecting, that the state of the health had brought on the glandular enlargement. It is one good rule when the patient will not admit that hehas had a chancre, or we cannot discover any traces of one, always to inquire into the state of the nearest lower extremity, and to ascertain whether there is any inflammation, wound, boil or sore, about the foot, leg, thigh, or nates; any bunnion on the great toe, or any inflamed bursa, or painful corn; for the inguinal glands are liable to inflammation and enlargement, in consequence of any of these causes.

---

* Ricord, Mal. Ven. p 40.

Buboes, which arise unpreceded by chancre (*bubons d'emblée*) or any other cause to which they can be ascribed, except a suspicious intercourse, M. Ricord observes, mostly affect the deep-seated glands; their progress is generally chronic; they have little tendency to suppuration; and, what is especially worthy of notice, the pus which they form never communicates the venereal disease by inoculation. M. Ricord further asserts, that he has never known constitutional symptoms follow a bubo of this description.*

In the treatment of a bubo, if it be a venereal one, we ought to be guided by the same principles as in the treatment of primary sores. The doctrine, that venereal primary sores may be cured without mercury, applies also to venereal primary abscesses and buboes. Although Mr. Hunter referred the efficacy of mercury to a specific action excited by it in the constitution, which action is represented as capable] of subduing the venereal complaints; yet he entertained a particular opinion, with respect to the modus operandi of this mineral, in the case of a syphilitic bubo. For instance, he had a high opinion of the usefulness of getting the mercury to pass through the diseased gland, which usefulness, real or imaginary, must have been ascribed in part, at all events, to the direct influence of the mercury on the gland, in its passage through it: he believed, that in this way buboes were sooner cured than when mercury was differently exhibited ; and it was therefore a great object with him to rub the mercury upon a surface, from which the absorbents proceeded to the gland affected. This practice is, perhaps, not deemed so essential at the present day; and some very good surgeons even think, that the irritation of the mercury will sometimes actually bring on swellings of the absorbent glands, or aggravate them if they exist. At all events, I may state, that the plan is not universally approved, especially when there is acute inflammation about the glands affected. When, however, the swelling is of a more indolent or chronic nature, the practice of making the mercury pass through, or to the gland, or even of applying it to the groin itself, is frequently adopted; and there can be no doubt, that such method has an influence in dispersing the swelling. On the contrary, if the gland should be much inflamed, and highly painful, the value of the practice is extremely questionable.

---

* Ricord, Mal. Véner. p. 149.

How long the use of mercury ought to be continued in the treatment of buboes, and what is the quantity requisite to be given, are questions to which different replies would be made in different schools. I consider myself to be of that party which, while it admits the possibility of curing all the forms of syphilis without mercury, fully admits the general usefulness of this mineral as a means of checking and eradicating the disorder; that it divides with the salts of iodine the repute of being the best means of lessening the risk of secondary symptoms, and of quickening the cure of many forms of the disease. But, for this purpose, I should say, that long continued and full courses of mercury are hardly ever requisite. In former times, when buboes yielded with tolerable celerity, it was the common rule to continue the mercury for about six weeks, at the end of which time it was entirely left off, and bark, sarsaparilla, and other tonics, given. Such was the general plan, when buboes yielded in a moderate time. On the other hand, if they subsided very rapidly, then the mercury was given for at least three weeks or a month after the healing of the bubo. But, we often find that buboes will not heal after mercury has been persevered in for a long time, and more especially when the health is much disordered by it. Here the discontinuance of the mercury is necessary, and such other medicines ought to be given as are likely to produce an improvement of the general health. Too long a perseverance with mercury will often retard the course of a bubo,—nay, will sometimes so derange the constitution, that the ulceration will spread from this cause alone, and assume a most dangerous condition.

In scrofulous constitutions, either the influence of the mercury, or the derangement of the system, arising from the united effects of this mineral and of the disease together, will frequently give rise to scrofulous glandular enlargements. When mercury is so employed for primary venereal sores, as to occasion a full saturation of the system, if there be a tendency to scrofula, this abuse of mercury will frequently act as an exciting cause of the latter disease, and its continuance be sure to render the patient's condition worse. Here the discontinuance of mercury is a *sine quâ non* in any plan likely to be attended with benefit; and instead of looking up to mercury for a cure, we should confide in remedies of another description, namely, bark, quinine, sarsaparilla, the diluted nitric or sulphuric acids, and narcotics, such as hyoscyamus, conium, opium, the acetate or muriate of morphia, &c. In some cases, also, it will be necessary to use such medicines as are considered to have a peculiar influence over scrofula, namely, iodine, or the carbonate of soda, and to let the patient have the benefit of a change of air.

It is a good rule not to be in too great a hurry to open a suppurated bubo, unless the matter is above a certain quantity, or has a tendency to spread, and then the sooner the swelling is opened the better. The matter is not always within the glands themselves, but often in the surrounding cellular tissue. In common examples, the skin should be suffered to become thinnish before an opening is made, and then a puncture may be made with a lancet or bistoury; but if the skin should be much undermined, and separated from the subjacent parts, some surgeons would prefer opening the abscess with caustic. In this manner a portion of the diseased skin may be destroyed, and a free opening made, well calculated for the ready outlet of the matter, and for obviating all risk of the formation of fistulæ and sinuses. One consideration, in favor of not opening buboes prematurely, is, that, after matter has collected within them, it may be absorbed again from the influence of mercury, or the iodide of potassium, aided by the effect of blackening the skin with the nitrate of silver, and then no opening at all will be required.

When a venereal bubo is much inflamed, antiphlogistic treatment will be necessary, as well as mercury, or the iodide of potassium; for specific inflammations, as well as common, are not out of the control of ordinary antiphlogistic remedies. We ought to apply leeches, and cold evaporating lotions, as in common inflammations; or, if cold applications will not answer, warm emollient ones, as poultices and fomentations, are to be tried. When a bubo becomes a sore, the local treatment must be regulated by the appearances, character, and condition, which the ulcer may exhibit. In relation to this subject, I have already given general directions in treating of ulcers. When all specific action has ceased in the bubo, the disease is of course only a common sore, or sore of one of the characters explained in the part of this volume, to which I have just now alluded.

When a bubo is in the form of a deep phagedenic ulcer, the application of a solution of opium, with a proportion of nitric acid in it, will often cause a rapid improvement of it. Even the undiluted nitrc acid, applied in the manner adopted for hospital gangrene, will sometimes prove the best application. Dr. Colles, in such cases, brushes the edges of the ulcer with the strong muriate of antimony; and he assures us that, however large the surface, "it will begin to heal, even if the edges alone be touched."*

Sometimes, after a bubo has burst, one of the enlarged glands will protrude above the level of the skin, and retard the healing process. In general, such prominent gland will recede again under the use of mercury, as Dr. Colles represents; but I have seen other cases, in which this has not happened, and the disease became so tedious, that it was judged advisable to cut off the highest part of the glandular protuberance, or to destroy it with caustic. I had such a case in University College Hospital last spring (1839). I do not mean such practice, however, to be adopted, unless the prominent gland should not be reduced under milder plans.

---

* Abr. Colles, M. D. on the Ven. Disease, p. 102.

A bubo occasionally leads to the formation of sinus, commencing at the public corner of the ulcer, and descending in the angle between the scrotum and the thigh. If the sinus cannot be cured by pressure, or does not heal under the influence of treatment adapted to improve the general health, we should either lay the sinus open throughout its whole extent, or make a counter-opening in a depending situation, and wash it daily with some stimulating injection, as advised by Dr. Colles. Another troublesome consequence of bubo, described by this last gentleman, is a superficial ulceration, spreading along the inside of the thigh, sometimes even to the anus, or upwards on the abdomen. One edge of this ulcer is deeply and slowly increasing, while the other is thin and may be healing. This has occasionally been named the *horse-shoe ulcer*. Mercury is generally useless or hurtful. The black wash is a good application; and, if mercury be tried, it should be in small doses.*

When the patient has been taking a great quantity of mercury, a bubo, after having burst, may leave the skin in an undermined state, with callous and irregular edges. These are mostly obstinate cases, and will sometimes remain unhealed for months. So difficult is it to bring such ulcers into a favorable condition by common means, that it may be requisite to cut away the hard callous edges, as a measure that at once removes a principal impediment to cicatrisation. Instead of this plan, a strong solution of the nitrate of silver, or a caustic solution of iodine, the undiluted nitrous acid, the nitrate of silver, or the potassa fusa, is sometimes applied to the callous edges of the ulcer. In general, under such treatment, their hardness will gradually subside and disappear; but, in the event of the case resisting this mode of treatment, the hardened and diseased edges of the ulcer should undoubtedly be removed with the knife. In this condition of a bubo, the liquor arsenicalis, sarsaparilla in lime water, or cascarilla with hydriodate of potash, or bark with the nitric or sulphuric acid, given internally, change of air, and sea-bathing, will frequently be of essential service.

What treatment ought to be adopted when a bubo arises unpreceded by any chancre? The statements of M. Ricord, already noticed, would of course incline us not to have recourse, at all events, to mercury; yet, if we listen to other authorities, mercurial treatment ought not to be omitted. Thus, Dr. Wallace informs us,—"I have treated certain cases of bubo, which were neither accompanied nor preceded by primary symptoms, but which had followed suspicious intercourse, as if they had been caused by the absorption of the venereal poison; and I have never had occasion

---

* Ibid. p. 103.

Google

to regret the practice. On the other hand, I have known buboes, which were not preceded by primary symptoms, to be followed by secondary symptoms when mercury had not been used in their treatment." Here we observe a positive disagreement between M. Ricord and Dr. Wallace on the question, whether secondary symptoms ever follow *bubons d'emblée?* The former states, that they never do, and, also, that inoculation with the matter of such a bubo cannot communicate syphilis by inoculation. In University College Hospital, we should never think of subjecting a patient to salivation for a bubo of this description, but adopt simple means for its dispersion, and, if this plan failed, try some other, according to the condition of the bubo, and the constitution. If the swelling suppurate, I recommend it to be treated as a common abscess; and either small doses of iodide of potassium with sarsaparilla to be prescribed; or, if there be any febrile disorder, saline antimonial medicines, with five grains of the pil. hydr. chlorid. comp. every night, or every other night, according to circumstances. If the swelling remain chronic, the skin covering it may be blistered, rubbed with the ung. potass. iodidi, or champhorated mercurial ointment, or blackened with the nitrate of silver. In some cases, compression is useful. With this treatment we may combine the internal exhibition of four or five grains of extractum cicutæ once or twice daily, and from ten to fifteen drops of the alcoholic solution of biniodide of mercury (L. P.) once, twice, or thrice a day.

SECONDARY SYMPTOMS.

Previously to the occurrence of *secondary symptoms*, the constitution may generally be observed to be somewhat disordered; there is more or less fever present, with accelerated pulse, headache, loss of appetite, pains in the limbs, and inability to sleep. Indeed almost all patients are particularly restless for two or three days before the appearance of any secondary symptoms; that is, before they complain of a sore throat; or perceive any traces of a cutaneous disease about them. When secondary symptoms take place, which does not always happen under any mode of treatment, and is not invariably prevented by any yet tried, they are more disposed to occur in some parts than others. On this account, Mr. Hunter divides the parts affected into two orders: the first order consisting of those, in which the secondary symptoms usually first show themselves; namely, the throat and skin, with which parts the iris and perhaps the joints are also to be arranged: the second, including parts in which the disease produces its influence at a later period, as the periosteum and the bones, to which may be added the nose, in which an ulceration of the mucous membrane, the ozœnasyphilitica with or without disease of the bones, is very common. In the second order of parts are likewise to be included the ear, the larynx, and the testicle, to which, however, the effects of syphilis less frequently extend than to the other parts here specified. I believe that Mr. Hunter's statement, respecting the throat and skin, agrees pretty well with general experience, and modern surgeons are inclined to accede to his doctrine in relation to them; though pains in the bones and joints sometimes precede the sore throat and cutaneous eruption. I have seen nodes follow a primary sore as the first secondary symptom, and this has also been noticed by others. I once attended a medical gentleman, who had no sore throat, and no cutaneous eruption; yet he had nodes. It is generally considered, that the interval between the primary and the secondary symptoms, is, on an average, from six to twelve weeks; but it may extend to several months, or, according to some reports, to one or two years. The earliest secondary symptoms generally commence within three months from the cure of the primary sore; but they may come on much more quickly, or even before the primary sore is healed. Almost every surgeon has had opportunities of seeing cases, in which there were at the same time an uncured chancre, an unhealed bubo, a sore throat, an iritis, and so forth, all existing together. According to the observations of Dr. Colles, when the primary symptoms have been treated on the mercurial plan, the secondary symptoms are generally later in making their appearance, and are also preceded by less disturbance of the system; but when mercury had been used only for a short time, or has been discontinued as soon as the chancre has healed, the appearance of secondary symptoms will be more early. He adds, that the same will be the case, if febrile action be excited by ordinary causes.*

AFFECTIONS OF THE SKIN.

The *eruption* presents considerable varieties. A few years ago, it was considered that no eruption was venereal, unless it had a copper colored appearance, and was scaly. Mr. Hunter represents the skin as at first becoming mottled, and tells us that such appearance will come out and fade away again repeatedly. Now, this observation must have been overlooked by former surgeons, who endeavored to prove that, without mercury, syphilitic symptoms invariably proceed from bad to worse; for here we find it stated, by their own great authority, that the eruption spontaneously disappears and then returns; that the disease fluctuates; yet the doctrine that Mr. Abernethy collected by his inquiries from all the most experienced surgeons in London was, that the symptoms of syphilis are continually progressive; and that when there is a true venereal sore, or eruption, it would always continue to get worse till mercury had been given. One form of syphilitic eruption is characterised by being scaly, and of a copper or reddish-brown color; small copper-colored spots first showing themselves, and the cuticle then peeling off. Some of these blotches conjoin, so as to form extensive patches; but others of the same color, and decidedly syphilitic, are, on account of their diminutive size and particular figure, sometimes termed the *lenticular* syphilitic lepra. The venereal eruption, according to Mr. Hunter, consists of copper-colored spots on the skin, accompanied by desquamation, which leaves the subjacent cuticle thicker and thicker as this process goes on, and of the same color as the cuticle which peels off. If the disease advance further, scabs will form, suppuration will take place under them, and the result be a *secondary venereal ulcer*, which, when thus produced, affects principally such parts of the skin as are in contact with other portions of the cutis, like the fold of the nates, the angle between the scrotum and thigh, or the armpit. In these situations, the eruption has a raised surface, from which a whitish matter frequently oozes. These copper-colored scaly blotches generally first appear on the face, hands, and wrist, and afterwards on the breast and the extremities, where they are particularly numerous, and assume the form of *lepra* or *psoriasis*. Another circumstance deserving of attention is, that when the palm of the hand or the sole of the foot, where the cuticle is very thick, is affected, an appearance is produced, constituting what is often termed the *syphilitic lepra*, and *psoriasis of the hands and feet*. Mr. Carmichael, like Mr. Hunter, regarded the scaly copper-colored eruption as characteristic of true syphilis; and though, says he, there are other eruptions which are venereal, or the consequence of venereal complaints, yet they are not truly syphilitic. He notices pustular, tubercular, and papular eruptions; but he does not consider these as consequences of a true Hunterian chancre, but refers them to primary sores of other descriptions. The syphilitic eruption seems to him always to consist of scaly blotches, in the form either of lepra or psoriasis, and unattended with fever; or, I should rather say, there is not so much fever present with these eruptions as with either of the others, namely, the papular, the tubercular, or pustular. As already noticed, Mr. Carmichael attaches so much importance to the form of the eruption, that he believes it possible to tell, by the inspection of the cutaneous disease, what has been the character of the primary sore. In short, he divides the venereal disease into four species or varieties. The first of these is the *scaly venereal disease*, or that which is correspondent to the Hunterian description, the chancre having a hardened edge and base; and when the bones are affected, their shafts and harder parts chiefly suffering, the nodes being true ones, and the eruption scaly, in the form either of psoriasis or lepra. The second is the *papular*, so called from the character of its eruption, which consists of inflamed pimples, and may follow gonorrhœa, and what some surgeons call the *gonorrhœal ulcer* of the prepuce and corona glandis. The third is named the *tubercular*, as being attended with an eruption of this character; and the fourth is the *pustular* variety of the venereal disease, so called also from the appearance of the cutaneous affection. The projecting incrustations, which are conical, or in the form of limpet-shells, constitute the appearance known by the name of the *venereal rupia*, which may follow an eruption, originally either tubercular or pustular. One important fact to be remembered is, that papular and pustular eruptions, when they have reached a certain stage, may be attended with a scaly appearance, which is, therefore, not exclusively the feature of lepra and psoriasis. This circumstance may, perhaps, explain some cases, in which the eruption seems to consist of scaly spots, and pustules and pimples, more or less mixed together.

---

* Practical Obs. on the Ven. Disease, p. 120.

Secondary venereal ulceration of the skin is often preceded by an eruption, some part of which, after repeated desquamation and scabbing, is converted into sores; but, in other instances, chronic inflammation takes place, independently of any eruption, and ulceration follows; and occasionally inflammation, suppuration, and secondary venereal ulceration, will occur over nodes. Secondary venereal ulcers have not any regular and constant appearance; they are frequently of a round shape, more or less chronic, and with an irregular, foul, ash-colored surface;] while others evince the peculiarity of healing in the centre and extending at the circumference, the unhealed part being of a tawny color, with sharp edges, and a foul bottom. No sooner does an experienced surgeon cast his eyes upon an ulcer of this kind, than he is led to suspect its venereal character; its tawny appearance, its shape, and its situation, will induce him to entertain a suspicion, that it has been preceded by other venereal complaints. But we should never conclude, from the mere look of a sore, that it is certainly venereal; but always take into consideration the history of the case, before a positive opinion is delivered.

Besides these secondary symptoms, presenting themselves as affections of the skin, I must not omit to specify the *ragged ulcerated fissures* and clefts seen on the nates, or about the anus (rhagades uni), and especially in the fold at the lower part of the nates, and between the perineum and the thigh, or sometimes even about the roots of the finger or toe nails. In the latter event, matter forms under the nail, which becomes detached, and the discharge is remarkable for its strong, fetid, and peculiarly disagreeable smell. Such is the *venereal whitlow*, as it is sometimes named.

Some *excrescences* in venereal patients, taking place especially about the genitals, perineum, and anus, receive different names, according to their various shape and consistence; as *warts*, *condylomata*, *fici*, &c. They are frequently accompanied with ulceration, or purulent discharge from the urethra or vagina; and they often grow from parts which have been ulcerated, though now healed. They are not essentially connected with syphilis; for we see precisely the same kinds of growths in persons, who appear never to have had the venereal disease. In women they are very common, and some of them do not appear to me to be materially different from particular kinds of hemorrhoidal excrescences. Formerly it was the practice to salivate patients for the cure of these excrescences, and this sometimes more profusely than for a sore throat or a chancre; and it must be acknowledged, that, when the system was thus brought and kept a long while under the influence of mercury, such growths generally dwindled away, and ultimately disappeared. The fact, however, that these excrescences could be as permanently and certainly cured with the knife, ligature, escharotics, and stimulating applications, as by mercury, was well known to some intelligent practitioners nearly half a century ago; and, what is still more to the point, it was known that the cure was radical. On what principle, then, could the severe measure of a long and profuse salivation be vindicated?

SORE THROAT.

One of the most common secondary symptoms is *ulceration of the fauces*, *tonsils*, *and a soft palate*,—in other words, a *sore throat*. What has generally been considered as the most unequivocal specimen of syphilitic ulceration of the throat, is remarked to come on without much previous inflammation, to begin on the surface of the part affected, and to extend more and more deeply; so that, when situated on the tonsils, an appearance is produced, as if a portion of them had been scooped away. The sore has a sharp prominent margin, and its excavated surface is covered with yellow adhesive matter, that cannot readily be separated from it. It is not uncommonly believed, that a sore throat, corresponding to this description, is peculiar to true syphilis, or the scaly form of the venereal disease—that disease, all of whose symptoms are sometimes thought more particularly to require large quantities of mercury for their cure, than other varieties of the venereal disease. On this point, however, I may observe, that the doctrine, to which allusion has here been made, is not so much insisted upon at the present day as it was some years ago. In fact this kind of sore throat has frequently been cured with sarsaparilla; and it sometimes follows sores, which have no kind of resemblance to the chancre with an indurated base and circumference. At the same time, the belief prevails, that whenever this kind of sore throat is accompanied by a scaly eruption, or by pains in the shafts of the long bones, or by true nodes, it will be more benefited by mercury than any other medicine. I sometimes employ small doses of the blue pill, joined with iodide of potassium and sarsaparilla. In University College Hospital we do not find it necessary, however, to keep up mercurial action for eight or ten weeks, as sometimes recommended even at the present day.

Besides this description of sore throat, there is another, consisting in superficial but foul and wide-spreading ulcerations of the tonsils, velum pendulum palati, and upper portion of the pharynx, accompanied by considerable pain, restlessness, and fever. On account of its appearance, it is frequently called the *ulcerous excoriation of the throat.* Mr. Carmichael thought he had traced it to be an effect of what he terms the *papular venereal disease*, or that which he conceived to arise from the *simple primary sore*, patches of excoriation on the prepuce, or gonorrhœa virulenta.

Sometimes a patient complains of experiencing severe pain whenever he attempts to swallow; yet the surgeon, on first inspecting the fauces, detects no ulcer, nor appearance of inflammation. In many such cases, there is an ulcer at the back of the pharynx, concealed by the interposition of the velum palati. "We should, therefore (as Dr. Colles directs), desire the patient to inspire as fully as he can; in attempting this, he raises the velum, and, if we then look into the pharynx, we shall generally discover the lower part of an ulcer;" and, to bring this more perfectly into view, the tongue must be depressed and the velum raised with a curved probe. The ulcer has a circular form, sinks deeply into the substance of the pharynx, has rather a foul but not a sloughy surface, and the surrounding inflammation extends only a very short distance from its margin.

An ulcer low down in the pharynx generally presents a foul, and sometimes a sloughy surface; and, according to Dr. Colles, the lower edge of it is very deep, while the upper part of it is superficial.

Another position, in which a sore is sometimes formed, is close to the insertion of the anterior palatine arch into the tongue. The ulcer, so placed, is deep and foul; but not sloughy.

In a few instances, we observe that the voice is rendered very nasal; the patient feels pain in swallowing; frequent desire to draw down the mucus from the back of the nares; and this, when coughed out, is often found slightly tinged with blood. The case is generally accompanied by fever. Under these circumstances, the ulcer is situated behind the velum, high up in the angle, between the upper and back part of the pharynx, or at the junction of its occipital and vertebral portions.*

---

* Abr. Colles, Op. cit. p. 124—126.

Certain *ulcers* of the throat have *a truly phagedenic character*, and are disposed, under improper treatment, to destroy the whole of the soft palate, and to extend their ravages to the pharynx, and even sometimes to the larynx, causing necrosis of its cartilages, and endangering life. With this form of sore throat, when the constitution is in an unfavorable state, from the injudicious use of mercury, there is a tendency to the production of caries and necrosis in the bones of the palate, and even in the upper jaw-bone and the ossa spongiosa; but, if the disease be properly treated, and the employment of too great a quantity of mercury be avoided, the patient will generally escape all this serious mischief. Accidental inflammations of the throat from cold, common abscesses, and chronic scrofulous enlargements of the tonsils, must be discriminated from venereal sore throats.

IRITIS.

One species of *iritis*, or *inflammation of the iris*, is an affection ranking as a secondary symptom of syphilis. After the appearance of disease of the skin, or sore throat, the iris sometimes inflames; this affection, which may follow, or accompany, various kinds of syphilitic eruptions, particularly the papular, and is usually attended with pains in the limbs and joints, I shall notice with other diseases of the eye.

VENEREAL AFFECTIONS OF THE MOUTH.

The tongue is sometimes the seat of venereal ulceration, which may occur at its base, apex, or edges, or on its dorsum. The characters of the sore are described by Dr. Colles as not being constant. Sometimes the point of the tongue, when this is the place of the disease, is broad and truncated, the surface of the ulcer covered with a thin and rather a soft slough, and the end of the tongue much swollen and indurated. In other instances there may be the same degree of swelling and hardness, but the surface of the sore, though foul, may not be sloughy. An ulcer of the side of the tongue is attended with induration, but less swelling. Occasionally a venereal ulcer of the tongue is attended with an enlargement of one of the lymphatic glands under the jaw. Ulcers on the dorsum of the tongue are generally of a circular form, and as large as a fourpenny piece, with the same characters as are seen in a secondary venereal ulcer of the skin.

The hardness attending a cancerous ulcer of the tongue, is what is termed *stony*, and, in this respect, is believed by Dr. Colles to differ from the kind of induration attending many venereal ulcers of that organ. But, says he, if a slightly elevated narrow ring, of considerable hardness, include an ulcer, whose surface is so clean as at first view to resemble a sore that is about to granulate, we may unequivocally declare it to be cancerous. In all doubtful cases, the patient is to try the effects of a slight ptyalism.

The greater number of ulcers of the tongue, occurring in venereal cases, arise, according to my experience, from the action of mercury itself; but, on this subject, I need not enlarge, as, in the second section of this work, ulcers of the tongue are further considered.

VENEREAL AFFECTIONS OF THE NOSE.

Ulcers of the alæ nasi may begin in the angle between the nose and cheek; and I fully agree with Dr. Colles, that whenever an ulcer, so situated, shows a tendency to phagedæna, or sloughing, it should be treated with some active caustic. The distinguishing characters of a venereal ulcer in the nose are, perhaps, not known; and are rather to be deduced from the history of the case. A scrofulous ozœna may be mistaken for an effect of syphilis. Dr. Colles refers to cases, as not being venereal, in which an ulcerated opening is formed in the septum nasi, about a quarter of an inch from its anterior extremity. He describes it as continuing for years precisely in the same state. Numerous ulcers of the septum nasi I find to be most successfully treated by applying the nitrate of silver, or a strong lotion of creosote, or chloride of lime to them, and giving from 3 to 5 grs. of the iodide of potassium in the decot. sarsæ. thrice a day.

VENEREAL AFFECTIONS OF THE BONES AND JOINTS.

If the swelling has come on suddenly, seems to be chiefly seated in the periosteum, and the pain is not remarkably aggravated at night, we may generally conclude that the case is not venereal. True syphilitic *nodes* are more indolent in their progress than the swellings to which I have now referred; and the pain of them is always more severe at night than in the day. They are particularly disposed to occur on the central portions of the long cylindrical bones, and on such parts of the bones as are not covered by any great thickness of soft parts. Hence, the front surface of the tibia, the surperficial part of the ulna, the sternum, the clavicle, and the cranium, are often the seat of nodes. The swellings, most likely to be mistaken for venereal nodes, are inflammations of the periosteum, and not of the bone itself, attended with pain in their very commencement, and even with redness of the skin; they arise suddenly, and frequently disappear in a short time, without the use of mercury. They have, therefore, more of the inflammatory character about them, than usually belongs to venereal nodes. The best plan, in all doubtful cases, is to inquire particularly into their history; we should consider the other symptoms which may have previously existed; the order in which they have occured; and the effect of any treatment that has been tried; and we must form our conclusion by connecting the present symptoms with all the other information that can be collected.

I believe that true nodes are rarely produced in syphilis, unless the patient has been using mercury. From this remark I exclude simple periostitis, which has certainly occurred in venereal patients, treated by me in University College Hospital without mercury. The late Dr. Hennen, a man of considerable observation and great experience, affirms that he had never seen more than two cases of nodes in patients who had not taken murcury. I know that some surgeons maintain that the fact is otherwise; but it seems to me, that there is a great deal of truth in Dr. Hennen's observation, and that we seldom meet with patients who have nodes, unless they have been taking mercury. But here the question arises, how far the mercury is concerned in producing these nodes ? In considering this question, we should recollect that, though we do not often see nodes in syphilitic patients, unless mercury has been given ; yet in liver complaints, for which mercury is often given in considerable quantities, and for an immense length of time, nodes are never produced. On the other hand, if no mercury be given in the treatment of syphilis, nodes will seldom be produced. Itseems, then, as if the action of mercury, and the influence of syphilis, together, had a share in bringing on these osseous swellings. At all events, it appears to me, that the venereal disease must be mainly concerned in the production of nodes. Still, there undoubtedly is foundation for the opinion that, unless mercury be given in some quantity or another, great or small, for the cure of that disease, nodes and other affections of the osseous system will rarely be excited. A node, once formed, will often remain for a long while unchanged; no increase of size, no discoloration, and no fluctuation being discoverable. In other instances, however, a node will slowly suppurate; which is observed to happen more frequently on the skull and tibia than other bones. If the bone be exposed by ulceration, or an incision, a thickish plate of it will sometimes get into the state of necrosis, and the ulcer will not heal till exfoliation has taken place. In other instances, the surface of the bone granulates, and the ulcer heals up, without any perceptible exfoliation having occurred.* I entertain not the slightest doubt, also, that there is some truth in the opinion that *caries* and *necrosis* are not so much the consequence of the venereal disease itself, as of the baneful influence of mercury, when it is rapidly and unskilfully thrown into the system, at a period when the patient is exposing himself to the weather, not confining himself at home, and committing the most imprudent excesses in diet. I believe that, under such circumstances, an individual is far more likely to have his osseous system affected, than one who observes a more prudent regimen during a mercurial course; and it is my firm conviction, grounded on remarks which I have made in practice, that caries and of necrosis of the bones of the nose would very rarely occur, if mercury were not given in immoderate quantities, and the patients took due care of themselves while using that medicine. Syphilis much more frequently extends its effects to the bones in cold, than warm countries.

---

* See Colles, Op. cit. p. 184.

The researches of M. Ricord fully confirm the Hunterian doctrine, that none of the secondary symptoms are capable of transmitting the venereal disease by inoculation. He accedes also to the proposition, that none of the secretions, either normal or abnormal, of individuals affected with constitutional syphilis, will serve for the communication of any venereal complaints by inoculation.*

TREATMENT OF SECONDARY SYMPTOMS OF SYPHILIS.

Here the same general rules and principles, respecting the use of mercury, are necessary to be attended to as in the treatment of the primary complaints. I may say, then, that mercury will frequently expedite the cure of the secondary symptoms; but that, in some states of the constitution, even when true syphilitic affections arepresent, or when ulcers, which were originally of this nature, have assumed the phagedenic or sloughing character, and are accompanied by considerable inflammation, or much derangement of the health, mercury is the most pernicious medicine that can be employed. Mercury is also improper when any extraordinary degree of inflammation is present with a secondary sore. No surgeon will ever treat either the secondary symptoms, or any other forms of the venereal disease, with judgment and discrimination, unless he recollect various facts connected with this subject; and one of these is, that mercury will generally benefit not only the ordinary forms of the venereal disease, but many other complaints; it will cure not only syphilis, but many other diseases which resemble it, and many also which are totally different from it. He should likewise recollect that many diseases, which are successfully treated with mercury, iodide of potassum, sarsaparilla, guaiacum, antimonials, mineral acids, the nitro-muriatic bath, creosote, &c., would generally get well of themselves, in the end, if the constitution could bear the requisite struggle. And, with respect to mercury, or any other powerful medicines, be it also remembered that, if they are not administered in such doses as totally to derange the whole economy, if only moderate quantities of them are exhibited, they will not commonly prevent any disease from taking a favorable course, if it be so disposed. Such reflections will ren-

---

* Ricord, Op. cit. p. 161—166.

Google

der the fact very intelligible how, in forming an opinion of the nature of syphilis, and of the effects of mercury upon the disease, so much deception has frequently occurred. A patient takes mercury in moderation, and his disease gets well, and then the practitioner is confirmed in his idea, that the disease was venereal, and has yielded to the specific remedy. But it will be sufficient to recollect the facts, here specified, to be convinced that mercury is by no means a test of the venereal character of a disease. In the treatment of secondary symptoms, generally, when mercury is given it is preferable to give it in moderate doses. In particular instances, it may be necessary to push the mercury beyond what may be denominated a mild mercurial course; but such examples are less common than sometimes represented. As a general piece of advice, therefore, I recommend the maxim of not aiming to excite a profuse and violent salivation.

With respect to secondary symptoms, it is a common remark, that when mercury is useful in this stage of syphilis, it generally shows its efficacy with even greater promptitude, than in the first stage, or in the treatment of the primary sores and buboes.

When the cutaneous eruption consists of scaly copper-colored blotches, presenting the character of either psoriasis or lepra, and not attended with much febrile disturbance of the system, and perhaps associated with that affection of the tonsils, which is sometimes thought to be the greatest test of true syphilitic ulceration in the throat, namely, the deep excavated ulceration, frequently accompanied by pains in the shafts of the long bones, the majority of surgeons agree, that mercury should be prescribed, and employed according to the principles I have explained; namely, in moderate doses, and not so as to excite a profuse and violent salivation, or to bring on severe derangement of the health. But, if the patient's health be much deranged, or he be considerably reduced and debilitated, I never give mercury, but commence the treatment with light tonics, as sarsaparilla, or cascarilla, and small doses of the iodide of potassium; or, if the latter disagree, the diluted nitric acid may be prescribed in lieu of it. Afterwards, when the patient's health is improved, mercury may be employed, if necessary; but, in University College Hospital, the greater number of venereal eruptions are easily cured without mercury, or with small quantities of it, joined with the iodides and other means. The fact has been so often witnessed there, by the numerous body of students always attending that institution, as not to admit of dispute.

Foul or phagedenic ulcers in the throat may be fumigated with the red sulphuret or with the grey oxide of mercury, or washed with a solution of the chloride of soda, the black wash, or gargles containing muriatic acid, or any other detergent gargle. Secondary ulcers in other situations may also be fumigated with benefit, and either poulticed till they granulate, or dressed with various applications, as with the water dressing, watery solution of opium, or henbane, when they are painful, or with the black or the yellow wash; or, if they are of a more indolent character, they may be dressed with the ointment of the nitrate of quicksilver, or with the red precipitate ointment, or touched with the nitrate of silver. I have known a lotion, composed of from four to eight drops of creosote in an ounce of distilled water, make obstinate secondary venereal ulcers of the skin heal, when other applications seemed to fail. The more I see of venereal sore throats, the more I am impressed with the value of the nitrate of silver as an application to them, and this even when the sore is attended with surrounding redness. In general, foul phagedenic ulcers of the throat are greatly benefited by it; but, if they resist its influence, the nitric acid, or the strong liquid muriate of antimony, may be used. They may be applied with a small camel-hair brush, or a bit of lint well secured to the end of an eye-probe.

When the eruption is papular, and has been preceded by a great deal of fever, and considerable disturbance of the system, and when such eruption ends in desquamation, we may employ bloodletting in the commencement, with the compound calomel pill and saline aperient medicines. The same practice should be pursued if there be pain and swelling of the large joints, accompanied by a diffused redness, and swelling of the tonsils and glands of the neck. Here it is to be suspected, that some particular state of the constitution has had a share in thus modifying the disease, rather than that the modification depends on some other poison different from that of true syphilis; but these still remain questionable points. After continuing the treatment that I have mentioned for a time, it is to be changed for small doses of James's powder, or antimonial powder, with decoction of sarsaparilla. Mr. Carmichael, who is a good practical surgeon, entirely disapproves of the use of mercury in the commencement of the treatment of the *papular form of the venereal disease;* he does not even give the compound calomel pill, which contains but a small quantity of mercury; in short, he expressly avoids administering mercury till the eruption desquamates, and then he admits that such medicine in moderate doses will be superiorly useful. With respect to that form of iritis which is met with in syphilis, often accompanying the papular eruption, mercury is highly necessary, and should be given freely, for reasons that will be explained when we come to the consideration of diseases of the eye. The papular eruption will often readily yield to iodide of potassium, in the dose of three grains, made up into pills, with one or two grains of the pil. hydrarg., and given once, twice, or thrice a day. In our hospital, this combination is often employed with great effect, and less injury of the health, than from the old custom of profuse salivations.

When the secondary symptoms are associated with a *pustular eruption*, we should begin the treatment with alterative medicines, especially antimonials, sarsaparilla, and iodide of potassium. After these medicines have been continued a certain time, we may presc ibe bark, and the nitric or sulphuric acid. What is called the *sulphurous bath* is also frequently highly beneficial, and so are the nitro-muriatic acid bath and lotions of the sulphuret of potash. Mr. Carmichael does not give mercury in the pustular form of syphilis, unless the pustules change into scaly blotches; but he chiefly trusts to sarsaparilla and guaiacum, with small doses of James's powder, or of the compound powder of ipecacuanha.

When white aphthous ulcers of the mouth accompany syphilis, they may be touched with a solution of the nitrate of silver, or with diluted muriatic acid: some surgeons particularly recommend the oxymel æruginis, and others the black wash, or a strong solution of the chloride of soda.

It would appear from Mr. Carmicheal's researches, that these forms of syphilis, comprising such as are termed *papular*, *pustular*, and I might add *tubercular*, do not require any mercury in their early stages; though it is admitted that, in all of them, after they have lasted a certain time, mercury will come in beneficially, bring the patient completely out of danger, and do what it would not have done, if given in an earlier stage of such diseases. In University College Hospital, we find, that most of these eruptions readily yield to the decoct. sarsæ., and small doses of the iodide of potassium; but, when they resist, I combine the latter with two or three grains of the blue pill, rarely giving a greater quantity in the course of the day; and few cases cannot thus be overcome, unless there be some manifest derangement of the health, preventive of the usual efficacy of these medicines. Then such derangement, whatever it may be, will require attention.

One observation, made by Mr. Carmichael, agrees with what I have seen; namely, that when the knee joint is enlarged and swollen from any cause connected with venereal complaints, mercury will never do any good, but, on the contrary, render the case decidedly worse.

With respect to the treatment of the *phagedenic ulcers*, which occur in the *advanced* stages of syphilis, and generally accompany or follow either the tubercular or the pustular eruption, they are rarely or never benefited by mercury in their early stages. On some tubercles or pustules scabs form, which assume a conical shape. In Mr. Carmichael's book there is a drawing of one of these conical scabs projecting from the forehead, and so long as to resemble a horn. I believe that, in this form of disease, termed the venereal rupia, mercury is injurious; and that one reason, why the osseous system is so often affected, is the exhibition of mercury in the commencement of phagedenic venereal ulceration. In the early stages, blood letting should not be omitted, unless there be some peculiar symptom or condition of the health prohibiting it. Antimonials, saline purgatives, and small doses of the compound powder of ipecacuanha, may also be employed with advantage. In all cases of phagedenic venereal ulceration, opium and its different preparations are truly beneficial. Sometimes opium may be combined with conium or hyoscyamus. Bark and the mineral acids are also frequently of particular service in the phagedenic varieties of syphilis; and the nitric acid has long enjoyed great celebrity. Besides these medicines, we have now another powerful auxiliary in the iodide of potassium, which, in the hospital of University College, has completely answered in the cure of phagedenic venereal ulcers, when aided by proper local treatment. How many bad cases have been brought to this hospital from workhouses and other places—cases attended with extreme emaciation, the utmost debility, loss of rest, and urgent hectic symptoms; yet, under the use of small doses of the iodide of potassium, decoct. sarsæ., an opiate at night, and a light nutritious diet, have soon terminated in a perfect cure.

When phagedæna affects the throat, the same general treatment will be of advantage; and, as for applications to the ulceration itself, we may use fumigations with the red sulphuret of mercury, or apply the black or yellow wash as a gargle, or touch the parts affected with the nitrate of silver. Another good plan is to touch the sore with diluted nitrous acid, applied by means of a camel-hair brush. The solution of the chloride of soda is another application which is now very much in favor. Sometimes phagedenic ulceration of the throat extends to the mucous membrane of the larynx, and even necrosis and exfoliation of the cartilages may be produced. When we have reason to suspect this sort of mischief to be going on, we should apply a blister over the larynx, or rub the neighboring skin with antimonial ointment, so as to produce counter-irritation. In the treatment of the secondary symptoms attending the phagedenic form of the venereal disease, we should always try alterative medicines, as antimonials, guaiacum, sarsaparilla, conium, the nitrous acid, or nitromuriatic bath, &c., before having recourse to mercury; for, under such treatment, the health will get into a more favorable state for the reception of mercury; and though at first we cannot advantageously give this medicine, yet, when the health has been improved, it may become of important service, if prescribed with moderation,

The treatment of *nodes*, and of *swellings of the periosteum*, is to be regulated by the history of the case, and by attending to various circumstances already specified. When the pain or inflammation in a joint or bone seems to be more acute than belongs to the character of syphilis and true nodes, the best plan is to employ leeches and fomentations and poultices, with aperient and antimonial medicines, or small doses of the compound powder of ipecacuanha, followed up by the iodide of potassium, and some light tonic. Such treatment will mostly give considerable relief. After the affection has been rendered more chronic, if it be still obstinate we may try blisters, which should sometimes be kept open for two or three weeks. In some cases, pus will form under the periosteum, and then nothing will afford relief, but making an incision, and forming an outlet for the matter.

True nodes require either a course of mercury, or of the iodide of potassium, or the latter medicine joined with very small quantities of the blue pill; but it is erroneous to think of continuing mercury till the bones are reduced to their natural level. If, after mercury has been employed to a certain extent, the nodes become stationary, all pain has ceased, and all appearance of specific action is at an end, the practice should be changed. Of course, at this period, the patient's health is generally a good deal reduced, and therefore we are called upon to endeavor to rectify whatever derangement of the constitution may be obvious. Such derangement is partly, perhaps, the effect of syphilis, but certainly, in many instances, more the effect of the mercury that has been given. We may, therefore, give the compound decoction of sarsaparilla, bark, or the sulphate of quinine, with or without the mineral acids; but, with respect to the nodes, we must now trust chiefly to local treatment, and, with this view, we may try frictions with mercurial ointment over the part, or with an ointment composed of ℥j. of mercurial ointment and j. of the hydriodate of potass, or ʒj. of the tincture of iodine, blended with an ounce of soap linament. Many practitioners are in the custom of covering nodes with the empl. ammoniaci cum hydrargyro. Nodes, which lead to suppuration and ulceration over them, may be followed by caries, or necrosis of the enlarged portion of the bone, and even of a more extensive part of it; and occasionally matter forms in the medullary cavity.

ENLARGEMENT OF THE TESTICLE FROM SYPHILIS.

This disease occurs in the more advanced stages of constitutional lues, being mostly chronic, and coming on without much pain. The enlargement is at first confined to one testicle; but afterwards both are sometimes implicated. There is, however, as Mr. Cusack* has described, an acute form of the disease, accompanying venereal hectic, pains in the bones, and scaly or other eruptions. I attended one horrible case with Mr. Doughty of Kensington, formerly one of my pupils, in which, after a most inveterate phagedenic ulceration and sloughing of the penis, both testes enlarged, suppurated, and at length sloughed away, with a considerable portion of the scrotum. The case had been under the care of an eminent surgeon at Brighton. This patient ultimately died. Mercury will not be of any service in the form of disease here adverted to; but, were I to meet a similar case, I would prescribe the iodide of potassium, with opium and tonics. The common veneral sarcocele yields to calomel and opium, and other means noticed in the observations on diseases of the testicle in our second section.

---

* See Dublin Journ. of Med. Science, vol. viii. p. 306.

DISEASE OF THE LARYNX FROM SYPHILIS.

In the advanced stages of syphilis, and especially where phagedenic ulceration of the throat has continued some time, and has been wrongly or inefficiently treated, the larynx becomes involved in the ravages of the disease. Its lining becomes thickened and ulcerates, and sometimes the cartilages are attacked with necrosis. This state is usually attended with great emaciation, extreme weakness, loss of rest and appetite, night sweats, frequent cough and expectoration of matter, loss of the voice, and paroxysms of difficulty of breathing, sometimes ending in asphyxia. So far as I have seen, mercury is more hurtful, than useful, in cases of this description. Tonic medicines, as bark and quinine, with the mineral acids, or sarsaparilla, with the iodide of potassium, are to be preferred, opium being given at night if required. A blister, or seton, may also be put in front of the larynx; and a discharge of matter kept up. In some instances, the prevention of immediate suffocation would justify tracheotomy. Portions of the cartilages have been known to exfoliate, and to be removed from an external abscess.

SYPHILIS IN INFANTS.

Syphilis is occasionally communicated to the fœtus in utero, through the medium of the blood of the mother. The effects of the syphilitic poison, thus developed in infants, may be said, therefore, to be secondary ones, as they arise from the introduction of the poison into the circulation of the fœtus, such poison not having been applied directly to the parts affected;—of course, then, the fœtus must receive the infection through the medium of the blood. Whether the child is ever primarily affected, that is, whether at the time of birth it ever contracts syphilis, in consequence of the direct application of the virus of a chancre with which the mother happens to be affected, is a questionable point. When the infant is actually *born with the disease*, the latter mode of communication is, of course, out of the question. I have already observed, that, in adults, with the exception of the parts of generation and of the mucous texture of the eyeball and eyelids, the venereal virus will not operate upon the general surface of the body, unless there has been some excoriation or wound at the period of its application. But if it be the fact, that an infant may contract a primary sore on any part of the general surface of its body, by such part coming in contact with venereal matter in the birth, then the remark which I have made, however true in relation to adults, cannot be extended to in-

Google

fants. But I believe, that few or no unequivocal cases, illustrative of this mode of communication from the adult to the child, are on record. On this point, however, Dr. Wallace declares, that there is no doubt that the child may be contaminated by the mother both *in utero*, and *at the moment of parturition.**

The symptoms of syphilis in the new-born child, or soon after birth, are mostly a universal desquamation of the cuticle, which peels off very extensively and freely; copper-colored blotches and scaly eruptions over a considerable part of the body; various rednesses and superficial ulcerations about the anus and nates, and sometimes about the parts of generation; also ulcerations and fissures at the corners of the mouth, and in the mucous membrane of the fauces, and sometimes on the eyelids. Besides these symptoms, there is frequently an obstruction of the nostrils, with a thick yellow secretion, so that the child cannot breath freely, and the respiration is attended with a snuffling noise. There is also an extraordinary degree of emaciation, the infant continuing to lose flesh daily; and, if not spedily relieved, it soon perishes. Abroad it is usual, in these cases, to give mercury to the mother, so as to affect the infant through her; but in this country, the cure of the disease is accomplished with such facility by certain preparations of mercury given to the child, that the latter plan is commonly adopted. We find that the disease readily yields to calomel, in half-grain doses, or to five-grain doses of the hydrargyum cum creta. The latter, as the milder preparation, is perhaps the better medicine of the two; it hardly ever fails.

On the subject of the influence of syphilis, an interesting question arises, whether the child, that has received the infection from its mother in the womb, is capable of communicating the disease to others? We find many cases on record of wet nurses having contracted venereal sores on their nipples, by suckling pocky children: and, if the statements be correct, the fact is curious; for syphilis exists in such infants, as it were, in the secondary form, and the occurrence would therefore prove that, in them syphilis, even in that form is capable of propagating itself, which is at variance with the Hunterian doctrines, and with what is commonly believed with reference to its nature in adult subjects.

When a pregnant female has chancres, she should be put under the mild influence of mercury, which will not only cure her, but save the child from contamination, or, if it be already infected, cure it also. Violent salivation, however, as likely to cause abortion, is to be condemned.

---

* See Wallace on the Venereal Disease, p. 125.

END OF VOL. I.